FRIDAY, JUNE 1, 1883.

TOO MUCH RED TAPE.

THE relief of the party now at the international polar station at Lady Franklin Bay is attracting the attention of those interested in arctic matters. In this connection, Dr. C. H. Merriam has written a pungent but timely letter, printed in the *New York tribune* of May 5. The expedition of 1882 was prevented by ice from reaching a latitude where any effective aid might have been rendered, — a fact which made the alleged drunkenness and incompetency of the person in charge of the relief party of little practical consequence, except to his associates in the service. That they were not disturbed by it is evident from the fact that his despatch on similar service this summer has only been averted by remonstrances similar to and including Dr. Merriam's. Fortunately for the credit of the country and for Lieut. Greely's party, the plans have been changed, and it is probable that a person rendered competent for the position by experience and intelligence will be put in charge, and possibly accompanied by one or two qualified arctic experts in an advisory capacity.

It is well known, that, within the limits of the United States, the possession of a naval or military commission and a congressional appropriation fully qualify the holder for any scientific, technical, or moral undertaking. Some, however, have been audacious enough to doubt whether this law holds good in any foreign jurisdiction, and whether the floes of Baffin's Bay are sufficiently under its influence to recoil more readily before brass than before horn buttons. One thing is certain, the service concerned will be held to a rigid responsibility by geographers and the public; and if military prepossessions result in the rejection of any practicable (if unmilitary) means of succor, physical or mental, the condemnation of any ensuing failure or disaster will fall where by common sense and military rules alike it belongs.

It is well known to those acquainted with the subject, that good arctic navigators, masters, and seamen, good ships for encountering the ice, and every article necessary for equipping a properly fitted expedition, can, by paying for it, be got at St. Johns from the sealing-fleet and its equippers; that the bad ice-navigation of 1882, from all indications, is likely to be duplicated this season; that, to be more than a contemptible pretence, the relief-party must be composed, rank and file, of men who know their business, and have the grit to do it; that the advice and unbought assistance of all arctic investigators within reach may be had freely by the responsible head of the Signal-service.

Knowing this, and believing that officer willing and ready to do the best and most reasonable thing in the premises, we await final action in the confident belief that past mistakes are not to be repeated, and that the results of cutting red tape will be creditable alike to the service and to the country.

THE ALPHABET AND SPELLING-REFORM.

THE letters of the alphabet are so variously sounded in different countries that they could not be internationally employed, with phonetic consistency, without altering the whole orthography of the different languages. French and English, for example, could not, by any adaptation of Roman letters, be made phonetically intelligible equally to French and English readers. Try to write such phrases as '*la langue française*,' 'the English tongue,' so as to show the actual pronunciation of the words, and the utter hopelessness of the task will be apparent.

The letters *n* and *g* have three distinct sounds — different from their alphabetic sounds — in the three words in which they occur in the above illustrations. In the word '*langue*,' the *n* is used merely as a sign that the preceding vowel is nasal, and the *g* has the second of its two regular 'soft' and 'hard' sounds. In the word 'English,' the *n* has a separate sound, which is not that normally associated with the letter, and the *g* has the same sound as in '*langue*.' In the word 'tongue,' neither the *n* nor the *g* is separately pronounced; but the combination has a distinctive sound, which is not represented by any letter in the alphabet. This sound of the combined letters *ng* is the same as that of the *n* alone in the word 'English.' In 'hanger' and 'anger,' 'longer'

(one who longs) and 'longer' (comparative of long), 'singer' and 'linger,' etc., the same diversity in the use of these letters will be observed.

The sounds of the vowel letters in the above illustrations are equally diversified. The letter *a* in '*la*,' '*langue*,' and '*-çaise*,' has three sounds, the second of which does not exactly correspond to any English sound. The letter *e* in the words 'the' and 'English,' has two sounds, neither of which is normally associated with the letter as an alphabetic element, and the second of which does not correspond to any French sound. The letter *o* in 'tongue' has a sound which does not occur in French, and which is different from either of the regular 'long' or 'short' sounds of *o* in English. In addition to these diversities in the sounds of single letters, the above six words illustrate another anomaly in the use of combinations of letters to denote simple elementary sounds, — as *th* in 'the,' *sh* in 'English,' and *ng* in 'tongue.'

On account of the impossibility of reconciling the varied associations of sounds and letters in different languages, spelling-reformers are obliged to limit their efforts to a single language, and to disregard all hope of arriving at international uniformity. This latter could only be attained by means of such an alphabet as that of Visible speech, which obviates international difficulties by furnishing a *physiological* key to the sounds of all letters. But an important immediate use might be made of a few of the Visible-speech symbols, to supplement the Roman alphabet by furnishing letters for sounds that are at present unrepresented. Many of the anomalies of orthography would be removed in this way, and with a minimum of interference with established usage. It is well known that we have six consonant sounds, which, for want of separate letters, are written by digraphs, or by various combinations of letters. These are, —

sh — in *fish* [*ce* in *ocean*, *ci* in *vicious*, *ti* in *notion*, etc.].
zh[1] — [*s* in *pleasure*, *vision*; *z* in *azure*; *ge* in *edge*, *rouge*.]
th — in *thin*.
dh[1] — in *then*.
wh — in *when*.
ng — in *sing* [*n* in *ink*, *anger*, etc.].

Even objectors to spelling-reform would probably admit the desirability of adding letters to the alphabet for all acknowledged simple sounds. In the present paper, consonants alone are dealt with. Arbitrary letters have been often proposed, but they have not met with acceptance. The Visible-speech letters — being physiological pictures of the organic formation of their sounds, and in no sense arbitrary — might, with great advantage, be adopted in these cases.[1]

New characters being wanted to supply the consonant deficiencies in our system of letters, there is no need to seek for forms in old or foreign alphabets, or to devise a set of arbitrary characters, when Visible speech offers for our use its physiological letters ready to fill every gap in our own or other alphabets. The following are the symbols which, in this system, denote the six unrepresented consonant sounds in English. The physiological meanings of the symbols need not be here explained; but the reader can judge of the simplicity of the forms, and of their adaptability for intermixture with ordinary letters, by the annexed illustrations.

	V.-s. symbols.	Script forms.
sh	Ω	$\mathcal{S}$
zh	ƨ	$\mathcal{Z}$
th	ʊ	$\mathcal{U}$
dh	ʊ	$\mathcal{U}$
wh	ɔ	$\mathcal{J}$
ng	ɐ	$\mathcal{R}$

ILLUSTRATIONS.

fish,	sheep,	catch,	ocean,	caution,	vicious,
fiΩ,	Ωeep,	catΩ,	oΩan,	cauΩon,	viΩous,
edƨ,	rouƨ,	aƨure,	meaƨure,	viƨon,	uƨual,
thin,	truʊ,	ʊree,	auʊor,	eʊnic,	aʊwart,
then,	ʊis,	breaʊ,	eiʊer,	gaʊer,	wiʊin,
why,	what,	when,	whether,	awhile,	nowhere,
ɔy,	ɔat,	ɔen,	ɔeʊer,	aɔile,	noɔere,
sing,	ink,	uncle,	angry,	sanctify.	
siɐ,	iɐk,	uɐcle,	aɐgry,	saɐctify.	

The advantage of adopting the required supplementary letters from a scientific and universal alphabet is, that the same additions, as well as others from the same source, may

[1] This orthography of the intended sound nowhere occurs in practice; but Roman letters admit of no better way of writing the element.

[1] Those who are not acquainted with Visible speech, as a source from which letters may be drawn as wanted, may be referred to the judgment pronounced on the system by the most eminent authority on phonetics, Alexander John Ellis, F.R.S., who writes to the Reader (Aug. 5, 1865), "Until Mr. Melville Bell unfolded to me his careful, elaborate, yet simple and complete system, I had no knowledge of alphabetics as a science. . . . Alphabetics as a science, so far as I have been able to ascertain, — and I have looked for it far and wide, — did not exist."

be used, as required, in connection with any other language employing the Roman alphabet. For example: the sign of nasality in Visible speech is ʃ ; and this character might very conveniently replace the *n* and *m* used in French, as in '*bon*,' '*temps*,' '*enfin*,' etc. The peculiar sounds of *ch*, *g*, and *w*, in German, as in '*nach*,' '*ich*,' '*auge*,' '*wie*,' etc., have very simple representatives in the physiological alphabet, which might, with great benefit, be adopted in the Romanic writing of German. The following illustrations exemplify these suggested improvements in French and German phonetic writing: —

boʃ, teʃ, eʃfiʃ, naC, iↄ, auɛe, ɜie.
bon, temps, enfin, nach, ich, auge, wie.

The alphabet that expresses the speech of America, England, France, Italy, and Spain, is a wonderfully imperfect instrument; but it is more imperfect in relation to the sounds for which it is used in America and England than in the other countries. Common sense revolts at the unnecessary difficulties imposed on the young by those who have got over the difficulties for themselves; for it must be acknowledged that the efforts of spelling-reformers have been resisted on no better ground than that of conservatism of error and defect, because established. Orthography has been considerably modified for local uses in Spain, and, to a more limited extent, in France. To the English-speaking races remains the task of effecting greater modifications to remove not only local, but international difficulties. For this purpose the alphabet itself must be reformed. This paper shows how such a reform could most hopefully be commenced. But why not have two alphabets? The new letters, being purely phonetic, would be a key to old letters, not only in English, but universally; and then the venerated orthography of our literature might remain undisturbed.

ALEX. MELVILLE BELL.

A STUDY OF THE HUMAN TEMPORAL BONE. — II.[1]

THE *labyrinth* is a complex receptacle of the internal ear, embedded within the petrosa, with its long axis parallel with this, and occupying a position intermediate to the tympanum and the internal auditory meatus. Its cavity is enclosed with compact walls for the most part not distinctly differentiated from the rest of the petrosa. It consists of three portions, named the vestibule, the semicircular canals, and the cochlea.

[1] Continued from No. 14.

The *vestibule* is an irregularly ovoidal cavity situated between the tympanum and the internal auditory meatus, communicating with the cochlea forward and inward, and the semicircular canals backward and outward. In its outer wall is the oval window, opening into the tympanum, but closed in the complete condition by the base of the stirrup. At the fore-part of its inner wall is a circular concavity, the *hemispherical fossa*,[1] at the bottom of which is a little group of minute foramina named the *middle cribriform macula*. The fossa is defined by an acute margin, which expands at the roof of the vestibule in a low *pyramidal eminence*. This is perforated by a group of minute foramina, the *superior cribriform macula*. On the roof of the vestibule, outwardly and behind the fossa indicated, is another less defined, named the *hemielliptical fossa*.[2] At the lower part of this is the aperture of the fine venous canal,[3] which communicates with the cleft on the posterior surface of the petrosa. Below the oval window is the *cochlear fossa*,[4] which, in the prepared bone, communicates freely with the cochlea, but, in the recent state, opens only at its fore-part into the vestibular passage of the same. Externally, above and behind the hemielliptical fossa, the semicircular canals communicate with the vestibule.

The *semicircular canals* are three horseshoe-shaped tubes, traversing the compact substance of the petrosa outwardly from the vestibule, with which they communicate by five apertures. They are compressed, cylindrical, and each has one end expanded in a pyriform dilatation named the *ampulla*. The *posterior canal*[5] is longest, is directed vertically outward, and extends lowest; the *superior canal* is directed vertically fore and aft, extends highest, and produces the conspicuous prominence on the front surface of the petrosa; and the *external canal*[6] is shortest, and is directed horizontally outward on a level with the ends of the superior canal, and the middle of the posterior canal. The ampullae of the superior and external canals occupy their fore-ends, are contiguous, and open into the vestibule above the oval window. The ampulla of the posterior canal occupies its lower end, and opens into the lower back part of the vestibule. The hind-end of the superior canal, and the upper end of the posterior canal, conjoin in a common canal, which opens into the upper back part of the vestibule; and the hind-

[1] Fossa hemispherica, recessus sphaericus.
[2] Fossa hemielliptica, recessus ellipticus.
[3] Aqueduct of the vestibule.
[4] Recessus cochlearis.
[5] Internal or inferior.
[6] Median, horizontal, least.

end of the external canal opens into the latter at its middle back part.

In the ampulla of the posterior semicircular canal is a little circular group of minute foramina, the *inferior cribriform macula*.

The *cochlea*, named from its resemblance to a snail-shell, is situated inwardly, and in advance of the vestibule. It is a broad, low cone, placed on edge, with its base applied behind to the bottom of the internal auditory meatus, with its axis directed forward and a little outward, and with its apex contiguous to the eustachian tube and the bend of the carotid canal. Externally it produces the promontory, and internally its wall is separated from the exterior compact layer of the petrosa by the spongy substance occupying the interior of the apex of the latter.

The cochlea consists of a cylindroid, slightly tapering tube, the *cochlear canal*, which winds spirally round a central column, named the *modiolus*. The tube makes nearly three turns, gradually projecting in its course, and ending in a rounded summit, the *cupola*. From the round and oval windows, the cochlear canal turns downward, inward, upward, and outward, and continues in the same relative course to the end.

The *modiolus*, or central column of the cochlea, is conical, with a broad base excavated and impressed by the spiral tract at the bottom of the internal auditory meatus, and with its apex terminating immediately behind the end of the cochlear canal. In the course of the latter, the modiolus undergoes a rapid reduction, and, in the view of a longitudinal section of the cochlea, appears as a short, wide, cylindrical column, with a second short and narrow one projecting centrally from the former. From the middle of the modiolus, in the course of the cochlear canal, there projects a thin shelf, named the *spiral lamina*. This reaches about half way across the canal, partially dividing it into two passages. In the complete condition of the labyrinth, a membranous tube, the *cochlear duct*, extends along the cochlear canal, between the spiral lamina and the opposite wall, and completely separates the two passages. Of these, one communicates with the round window of the tympanum, and is hence called the *tympanic passage*,[1] while the other communicates with the vestibule, and is named the *vestibular passage*.[2] The two passages communicate with each other at the summit of the cochlea, within the cupola, by a common orifice.[3]

The turns of the cochlear canal being contiguous, in a longitudinal section of the cochlea, they appear separated by a partition extending from the modiolus to the periphery of the cochlea and gradually thickening as it approaches the latter. The partition is thickest at its commencement, and gradually becomes thinner in its course, until it abruptly terminates in a crescentic edge extended between the apex of the modiolus and the cupola. The interior surface of the cochlear canal, exclusive of the modiolus and spiral lamina, is imperforate and smooth. Opposite the spiral lamina it is commonly marked by a faint line, indicating the attachment of the spiral ligament.

The surface of the modiolus curves continuously from this into the surfaces of the cochlear canal and spiral lamina. In transverse section the canal appears more or less reniform.

The spiral lamina is widest at its commencement, opposite the round window, gradually narrows in its course, and ends in a hook-like process[1] projecting from the apex of the modiolus. At its commencement a narrower portion[2] is continued around to the opposite side of the cochlear canal, where it arches over the round window. The anterior surface of the spiral lamina is directed into the vestibular passage. A groove along its middle divides it into two zones, of which that next the free edge is the more compact and even. The posterior surface looks into the tympanic passage. The free edge is rounded and minutely serrulate.

The surfaces of the modiolus and spiral lamina are minutely porous for the transmission of vessels and nerves; and this condition is more marked within the tympanic passage.

Commonly a row of larger elliptical foramina, or pits, is situated within the latter passage, along the root of the spiral lamina, extending on the modiolus, giving this position a fluted appearance. The arrangement is of variable regularity, sometimes interrupted, and at times obscure. A narrower row of smaller and more numerous foramina occupies the base of the modiolus within the same passage. A row of small foramina is also variably conspicuous at the bottom of the modiolus, contiguous to the spiral lamina in the vestibular passage. Within this, also, the modiolus is more or less marked by minute radiating grooves, which advance and branch on the anterior surface of the passage.

The modiolus is composed of fine spongy substance defined by a thin, more compact layer. It is traversed by a *central canal*, for the transmission of an artery, commencing at the central aperture of the spiral tract, and

[1] Scala tympanica. [2] Scala vestibuli. [3] Helicotrema.

[1] Hamulus. [2] Lamina spiralis secundaria.

ending at the apex of the modiolus. A larger *spiral canal* traverses it just behind and along the course of the spiral lamina, for the accommodation of the spiral ganglion. Numerous fine canals, communicating with the minute foramina of the spiral tract, likewise traverse the modiolus, for the transmission of the filaments of the cochlear nerve. The canals in their advance are successively reflected to open into the spiral canal of the modiolus.

The spiral lamina is composed of two delicate compact layers, with an intervening delicate spongy layer, which is traversed with numerous fine radiating and anastomosing canals. These communicate with the spiral canal of the modiolus, and terminate in minute apertures at the free edge of the spiral lamina.

The tympanic passage of the cochlea is directed from the round window downward, forward, and inward. It is crossed below, just in advance of the window, by a little crest,[1] to the inside of which is the aperture of the fine venous canal communicating with the pyramidal pit of the jugular foramen. The vestibular passage communicates with the vestibule internally to and above the tympanic passage, and below the position of the oval window.

The round window looks outwardly from the tympanic passage into the arched recess at the back of the promontory. It is beneath and a little external to the position of the oval window, from which it is separated by a vaulted arch formed by the upper part of the promontory. It is irregularly circular or somewhat oval, and about a third less in size than the oval window.

[1] Crista semilunaris.

GLACIAL DEPOSITS OF THE BOW AND BELLY RIVER COUNTRY.

DURING the progress of the geological examination of the Bow and Belly River country, which lies for the most part in the drainage-area of the South Saskatchewan, north of the 49th parallel, and immediately east of the base of the Rocky Mountains, several points of considerable interest and importance in the history of the glacial period have been observed. These observations, though made in the summer of 1881, have not yet been published; and, as it is hoped that the work of the coming season may add largely to our knowledge of this and neighboring districts, a detailed report is likely to be still further deferred. A brief general notice may in the mean time be of interest to the readers of SCIENCE.

A systematic account of the 'surface geology' of this and other districts in the vicinity of the 49th parallel was first given by the writer in 1875.[1] Observations were, however, at that time, necessarily confined more or less closely to the neighborhood of the 49th parallel. The late examination of the Bow and Belly country has been much more complete, embracing an area of about 20,000 square miles. The surface of this region declines, but not uniformly, from a height exceeding 4,000 feet along the base of the mountains to about 2,500 feet in its eastern and north-eastern parts. With the exception of a strip of country which may be designated as the foot-hills of the Rocky Mountains, the whole of this tract is covered more or less deeply with material which may be generally referred to as 'drift.' Over considerable areas this covering is from 100 to 200 feet in thickness; but in other places it is comparatively scanty, particularly on some of the more elevated plateaus of cretaceous and Laramie rocks. During later tertiary time the country has evidently been subjected to very extensive denudation; and its surface must have been much more diversified at the onset of the glacial period than it is at present. The drift deposits have evidently filled pre-existing hollows and low tracts; and the general effect has been a filling-up of its irregularities, and the production of wide areas of almost level prairie country. In cutting out their beds anew in the modern period, the rivers have in some places exposed fine sections of the cretaceous and Laramie rocks, while in others the base of the drift deposits has not been reached.

Resting immediately on the surface of the cretaceous and Laramie rocks in a number of localities on the Bow, Belly, Old Man, and other rivers, is a deposit of well-rolled pebbles or shingle, consisting, for the most part, of hard quartzites, and derived entirely from the paleozoic rocks of the Rocky Mountains. These pebbles are seldom more than a few inches in diameter, and often very uniform in size. The deposit has been observed to extend to a distance of over a hundred miles from the base of the mountains. Whether it has been carried from the mountains entirely by the action of rapid streams of preglacial times, or has been distributed in some more extended body of water, I am as yet unprepared to decide; but the fact that it occurs at very different elevations above the present water-level in neighboring sections on the same river, would appear to point to the latter conclusion. No marks of ice-action have been found on the stones of this deposit, which at one place on the Belly

[1] Quart. journ. geol. soc., Nov., 1875. Geology and resources of the 49th parallel.

was observed to be associated with stratified sand-beds.

Resting upon the shingle deposit in some localities, but in other places directly on the cretaceous and Laramie, is the bowlder-clay, a mass of sandy clay, often very hard, and not infrequently showing a pretty well marked relation in colors and material to the underlying soft rocks, from which it has evidently been largely formed, but packed irregularly with bowlders and fragments of Laurentian and Huronian origin, often distinctly glaciated, and with quartzite pebbles resembling those above described. While generally rather massive in character, the bowlder-clay is frequently more or less evidently divided by stratification-planes, and is quite distinct in appearance from the morainic accumulations which occur in the foot-hill belt.

The upper part of the bowlder-clay is usually much more distinctly stratified than the lower, and often more or less markedly lighter in color, though still holding numerous stones and bowlders of mingled Laurentian and Rocky Mountain origin. In the region through which the lower part of the Belly River cuts, a series of well-stratified sands and sandy clays are intercalated between these two divisions of the bowlder-clay; and in several sections these were observed to include an irregular layer of impure lignite or indurated peat a few inches in thickness, evidently the accumulation in a swamp or shallow lake which must have covered many miles of surface. A thin nodular deposit of ironstone was also found in association with the lignite at one place. This is the first evidence of an interglacial period, or interruption of the severity of the glacial conditions, which I have met with in the area of the great plains; but the facts are here perfectly clear and conclusive.

The surface of the plains generally is often strewn more or less thickly with erratics, which, except in the immediate vicinity of the mountains, are usually derived from the Laurentian axis; and, as they are frequently larger than any of those characterizing the bowlder-clay of the neighborhood, there is reason to believe that they belong to a subsequent period of dispersion. Several very large bowlders of Huronian quartzite occur near the Waterton River, not far from the western limit of the Laurentian and Huronian drift. One of these measured $42 \times 40 \times 20$ feet; and as no rocks at all resembling that of which these bowlders consist, or the gneisses and granites of the Laurentian, occur in the eastern ranges of the Rocky Mountains (which are everywhere here continuous and wall-like), there can be no doubt as to their eastern or north-eastern origin. As already stated in my Boundary commission report, the western margin of the region characterized by Laurentian and Huronian drift is here about seven hundred miles from the nearest part of the Laurentian axis, and within a few miles of the base of the Rocky Mountains.

In the publications above alluded to, a number of cases have been instanced, of the great elevations reached by erratics of eastern origin in the western portion of the Great Plains. The following additional examples from the district now in question may be added. The heights given are barometric, but have been worked out by comparison with the U. S. signal-service observations at Fort Benton, and may probably be depended on to within fifty feet. At the summit of the high ridge crossed by the trail between Fort MacLeod and Pincher Creek, Laurentian stones were found at an elevation of 4,390 feet; near the summit of the Rocky Spring Ridge, on the trail from Benton to MacLeod, and at several points about the intersection of the 49th parallel with the western branch of Milk River (long. 113°), at elevations between 4,100 and 4,200 feet. On the flanks of the W. Butte (lat. 49°, long. 111° 30′) Laurentian bowlders of small size, and pale limestone resembling that of the Winnipeg basin, are abundant at an elevation of 4,600 feet, while the highest actually observed fragments attained an elevation of 4,660 feet.

Evidence of the fact that glaciers of considerable size debouched from the valleys of the Rocky Mountain range is found in many places. The grooving and fluting of the limestone rocks near the efflux of the Bow River from the mountains, and the moraines strewn with bowlders of local origin near the mouth of the South Kootanie Pass, and thence for thirty miles or more northward along the base of the range, may be specially noted.

In the foregoing notes no theoretical explanations of the facts have been advanced. These have been elsewhere discussed. In the publications above referred to, I was, I believe, the first to define the so-called Missouri côteau as one of the most gigantic monuments of the glacial period of the continent, though arguing against its formation as a moraine. In whatever way the origin of the côteau may eventually be decided, it is, however, well to remember that it holds a position on the northern plains scarcely more than midway between the Laurentian axis and the western margin of the Laurentian drift, and that the transport of material to a much greater distance, and to twice the altitude of the côteau region, has also

to be accounted for,— facts, possibly, best explained on the supposition of a greater subsidence of the western as compared with the eastern regions leading to submergence of the plains under water sufficiently deep to carry icebergs of large size.

GEORGE M. DAWSON.

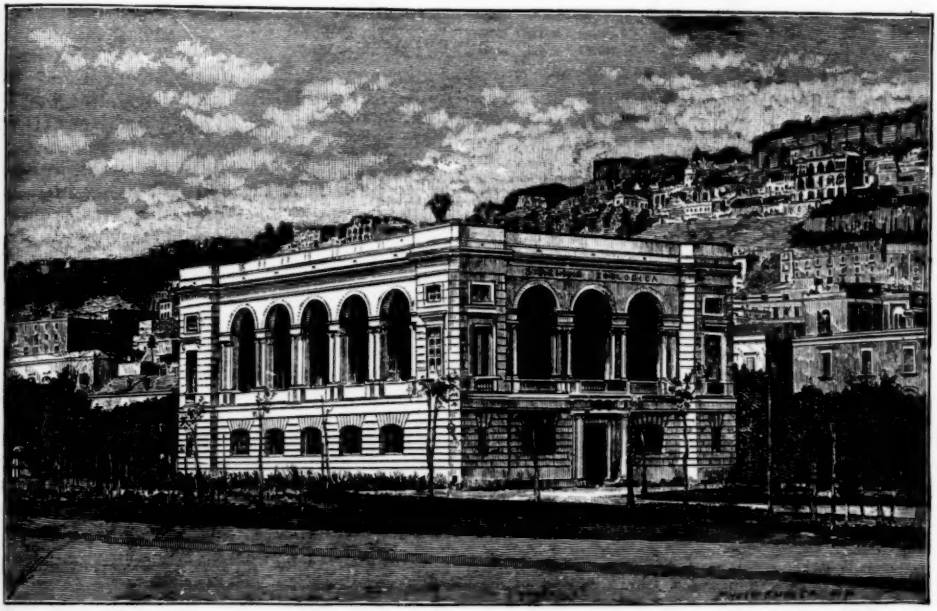
Geol. survey of Canada, Ottawa,
April 10, 1883.

THE NAPLES ZOÖLOGICAL STATION.

I.

FOR half a century past, Naples has been the favorite resort of the zoölogists of Europe on account of the wealth of the fauna of the neighboring waters. But the independent efforts of solitary naturalists were naturally unable to secure all the advantages for science which could be gained by suitable organization. Two old fishermen, who, forty years ago, were turned aside from fishing for the market, and trained to collect for science by Johannes Müller, are still at work in the gulf, not now alone, but with a dozen other men, collecting with dredges, nets, hooks, and scaphandra, material for nearly thirty investigators, studying with all the resources of a completely organized laboratory in the zoölogical station.

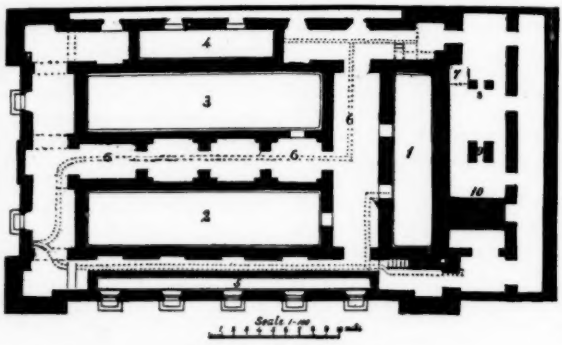
Dr. Anton Dohrn, in his voyages to the Mediterranean to carry out his researches, experienced, as others had done, grave difficulties which he could not, single-handed, overcome. To realize the conditions necessary for extensive and thorough work requires not only a large expenditure of money and time, but a permanent and growing institution, which provides all the instruments of research in a locality where nature furnishes in abundance and variety the material to be studied. To carry on biological work on a large scale in as many directions as possible, with a thoroughly equipped laboratory, permitting investigators to apply to their researches the most



elaborate technical processes, and to make use of the best modern methods, with all the material that these rich southern regions can supply, all the help that may be had from a well-furnished library, all the aid that can be obtained from well-trained attendants and subordinates, and all the stimulus and assistance that consciously and unconsciously comes from the intercourse of many minds giving their best powers to the same work, — this is the aim of the zoölogical station. To this object Dr. Dohrn has devoted the last fifteen years of his life, making even his own important researches a secondary consideration;

and, having founded the station, he has gathered about him a group of earnest investigators, animated by the same spirit, who form its permanent scientific staff.

The station was opened in 1874; and the total cost of its building was $85,000, exclusive of the cost of the site, which was given by the Neapolitan municipality. Dr. Dohrn contributed $60,000 of his own property, and obtained a grant of $20,000 from the German government. The other $5,000 was presented by some of the eminent friends of science in England, — Professor Huxley, Sir Charles Lyell, Mr. Darwin, Mr. Balfour, and others.

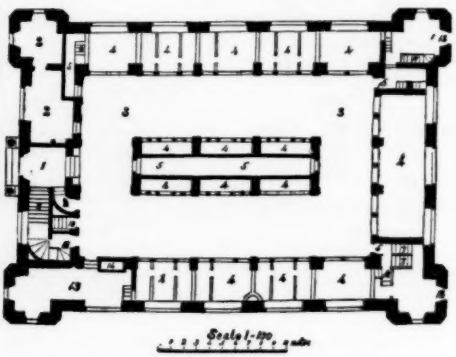


PLAN OF BASEMENT.

1. West reservoir; 2. South reservoir; 3. North reservoir; 4, 5. Storage basins; 6. Pipes connecting the reservoirs and basins with the pumps; 7. Pump-reservoir; 8. Pumps; 9. Engine; 10. Boiler.

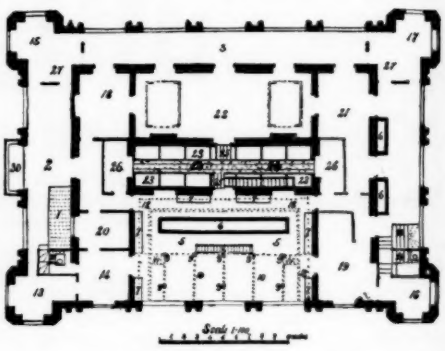
The situation of the building is exceedingly fortunate; it stands in the middle of the gardens of the 'Villa nazionale,' a few rods from the shore; and from its loggia one looks southward, over the wide expanse of the gulf, to Capri in the distance, westward to the ridge of Ponlippo, eastward to the mountains of St. Angelo, while to the north-east the town rises in terraces from the bay, in the form of an amphitheatre, with the smoke of Vesuvius in the background, rising into the sky, and floating away towards the horizon.

The lower floor of the station is occupied by the well-known public aquarium, which consists of thirty tanks, the largest holding two thousand cubic feet of water. The beautiful creatures of the Mediterranean are to be seen in these tanks, living in their natural conditions, — the delicate transparent pelagic animals, the medusae, ctenophores, and salpae, the expanded corals and polyps and tube-worms, with their brilliancy and variety of



PLAN OF GROUND FLOOR, OR AQUARIUM.

1. Entrance; 2. Office; 3. Open space for visitors; 4. Aquarium; 5, 6. Passages and staircases for the service of the basins; 7. Staircase to laboratory; 8. Main staircase to same; 9. To basement; 10. To retiring-rooms; 11. To engine-room; 12. Entrances for fishermen and attendants; 13. Small laboratory; 14. Working aquarium of the same.



PLAN OF UPPER FLOOR, OR LABORATORY.

1. Main staircase; 2. East loggia; 3. South loggia (both open); 4. West loggia, closed by windows; 5. Large laboratory; 6. Working aquarium; 7. Large cabinets; 8. Iron staircase leading to 10, platform at mid height supported by iron pillars (9); 11. Staircase leading to 12, gallery destined for the collections, but at present used as the library; 13–18. Unfinished rooms attached to the laboratory; 19, 20, 21. First, second, and third assistants' rooms; 22. Great hall intended for the library; 23. Lighted court; 24, 25. Longitudinal and transverse passages through the same; 26. Vestibules; 27. Restaurants; 28. Staircase to aquarium; 29. Staircase to attic; 30. Chimney; 31. Balcony.

color, and the thousand other creatures of various size, up to the large octopus and the great edible turtle. The aquarium was intended to produce a revenue which should cover a considerable proportion of the expenses of the station, — an expectation which has not been fulfilled. Nevertheless, it is appreciated by all who visit it as a source of great delight and interesting knowledge, while it is indispensable to those who work in the station as a means of study and a reservoir of material.

Beneath the floor of the aquarium is a labyrinth of underground rooms, containing the engines, cisterns, and pumps by which the circulation of water is maintained throughout the tanks and the smaller aquaria in the laboratories above.

To the right of the main entrance to the public aquarium is a marble staircase, which the uninitiated are forbidden, in various languages, to ascend. It leads up to the part of the building devoted to scientific studies; and thus immunity is secured from all noise or disturbance. The naturalists at work hear only the breaking of the waves, or, at times, the sounds of music from the gardens, and the distant murmur of the city. On the northern side of this second story is the great laboratory, lighted by a row of windows twenty-five feet in height. It is fitted up for twelve workers; the tables, drawers, and shelves of each being so arranged as to form under a window a kind of alcove, which is thus well lighted from the north, and is fitted up independently with reagents and apparatus. Down the centre of the room is a long aquarium, consisting of two reservoirs, one above the other; so that, by means of siphons, circulation of sea-water may be kept up in the various vessels which the occupants of the tables use to isolate the animals they are studying, or to contain ova and embryos in course of development.

Besides this general laboratory, there are twenty small rooms fitted up for the same purpose, each provided with its own apparatus and aquaria.

The south side of the large laboratory has two windows opening on a central court lighted by a skylight in the roof, and extending down to the floor of the public aquarium, whose central tanks are arranged around it. A short bridge across this court leads to the library, which corresponds in size to the laboratory, and opens on to a spacious loggia running along the whole south side of the building. The library is well furnished and excellently lighted; and there is scarcely a work on any branch of biology, classical or recent, or any current scientific periodical of reputation, which is not to be found on its shelves. The height and fine proportions of the room are in keeping with the dignity of its function; and its walls are tastefully decorated with interesting frescos appropriate to the situation and character of the station.

To the west of the laboratory and library are the rooms where the material brought into the station is deposited, sorted, and distributed, and where the conservator, Salvatore Le Bianco, and his assistants, preserve specimens for the collection of the station, and for sending to distant laboratories or private investigators. In one of these rooms are the shallow tubs where the contents of the dredges are poured out, washed, and searched by a number of boys; and the variety of beautiful and interesting creatures to be seen here, everywhere around, produces an enthusiastic delight in the zoölogist on his first visit; and the impression is in no way lessened when he examines the exquisite collection of preserved specimens in Salvatore's room, and sees the most delicate and sensitive creatures — corals, alcyonaria, transparent medusae, and ctenophores — fixed in the fully expanded condition, and preserved in their natural shape. This result is obtained by a different method for almost every animal; and the successful treatment has been discovered, sometimes by a fortunate idea, but usually by patient and careful series of experiments.

THE SPECTRUM OF AN ARGAND BURNER.[1]

I HAVE been lately requested to determine the distribution of energy in the spectrum of an argand burner, and have been able to do this by means of the apparatus and methods previously employed at the Allegheny observatory for mapping the invisible spectrum of the sun. The results are curious; and, in the hope that they may also be found useful, I desire to communicate them to the academy. The difficulty in such a determination lies in the mapping of something which is wholly invisible; and it has not been made before, I presume, in spite of its economical importance, because there has been no means known of measuring this invisible energy, except in a rough way, by the thermometer or thermopile, by a process which gives incomplete results.

It was my object not merely to indicate

[1] Read before the National academy of sciences at its Washington meeting, April, 1883.

how much of the radiation from a gas-burner was visible, and how much was not, but to give a map of its distribution on the normal or wave-length scale, which would enable any one to see the quality and amount of the energy in each part of the light and heat region.

The ordinary argand burner, burning common house-gas within a glass chimney, was first placed at the centre of curvature of a large Rowland concave grating; and, by means of the bolometer, the heat was measured at successive points in the spectrum down to a wave-length of about .001 mm., where the overlapping second spectrum began to be sensible. Even in the preliminary determination, it was interesting to observe that the distribution of the heat was totally different from that in the sun, and that, instead of growing smaller, it grew greater, as the bolometer passed from the visible to the invisible end. As it was evident that the heat was still increasing at the point where the evidence from the grating failed, all the measures were next repeated with a prism of a special glass known to be transparent to the invisible rays. (It was first attempted to use the linear thermopile; but the heat was insufficient, and the linear bolometer was substituted.) With this, as many as thirteen ordinates were measured (representing the proportionate heat at as many points), their respective indices of refraction being determined by the known refracting angle of the prism and the observed deviations on the circle of the spectro-bolometer.

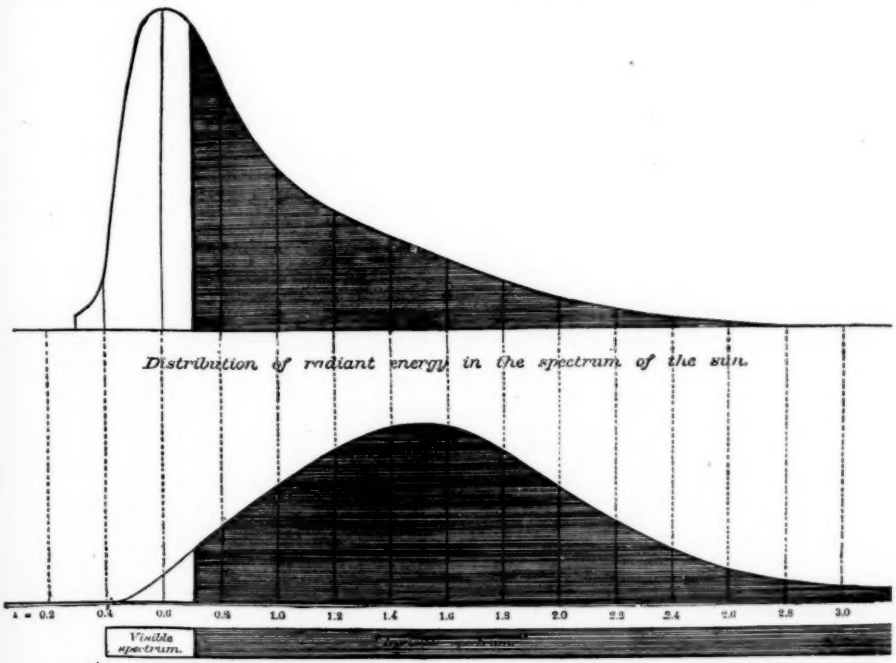
In a late communication to the academy, I gave the results of a recent research upon the connection between indices of refraction and wave-lengths, which enable us to deduce the normal spectrum (invisible as well as visible) from the prismatic one. It appeared to me when I was engaged in the first investigation, which to all but students of the subject must seem abstruse, that its results were of a kind which could never have much other than a theoretical interest: but it happens that this their first application is of a utilitarian character; for, having thus converted the prismatic values into corresponding ones on the wave-length scale, I was able to represent the conclusions from both by the normal maps which I now have here, and which exhibit the results of the analysis of the radiant heat which has come through the chimney. Let us remember that this radiant energy differs wholly in its qualities in different parts, and that the quality is shown by the wave-length number on the horizontal scale; the amount, by the height of the curve at that point. Near the part with wave-length .5 it gives the eye the sensation we call blueness, and near .7 it appears as a dull red, bringing very little light; at the point .9 or .10 it makes on the most sensitive eye no impression whatever, but has the power of passing freely through the glass chimney; near .3 the glass, so transparent to the light, is almost wholly opaque to the energy: so that each part has some quality peculiar to itself. By far the most important of these qualities, for our present purpose, is that of giving light. If we then analyze the radiant energy which comes through the chimney, the result is shown in our lower curve. The energy, which is what the gas supplies at the cost of the production from the coal, is for our present purpose regarded as saved or wasted, according as it is visible (light) or invisible (dark heat). The energy first becomes measurable in the blue, where there is very little of it, but where all there is, is effective as light; it increases steadily to the extreme red ordinarily visible where there is a great deal of it, but of a quality which is only interpreted by the eye as a dull reddish glow of little value for lighting; and then goes on increasing where it passes into complete invisibility, and still continues to increase as (for the present purpose) *pure waste*, till its maximum is reached at a wave-length of 1.5 or 1.6, — something like three times the length of the visible spectrum below the lowest visible ray. The energy at any point being proportional to the height, the entire radiant heat is proportional to the area of the curve. If we draw it on such a scale that this whole area equals 100, we can see the percentage expended in any kind of radiation at a glance. The small, nearly triangular area to the left of the line at .7, for instance, represents all the radiant energy useful as light; and this area being by measurement 2.4, while that of the whole curve is 100, we see that 2.4% are employed as light, and the remainder, 97.6%, are wasted. But this refers to the *radiant* heat alone, and takes no account of that expended in heating the air by convection currents. I have heard this latter estimated at three-quarters of the whole, but have not myself measured it. Admitting that this is approximately correct, however, it follows, that, since only one-quarter is radiated, it is 2.4% of this one-quarter only, which is light, and that finally less than 1 % of the whole is used, and more than 99% wasted.

It is instructive to take an amount of solar

energy exactly equal to that we have just analyzed in the gas-burner, and notice how totally different it is in kind. The upper curve shows the distribution of such a small sample of the sun's radiation as shall be exactly equal to that from the argand burner. Of 1,000 parts of sun energy, 340 appear as light, and 660 as dark heat, if we take the dividing-line between light and darkness at the same point (wave-length 0.0007 mm.) in each curve. If we look at the quality of the light, the difference is enhanced. The sun-curve attains its greatest height in the yellow, which here means that the energy is not only most efficient in making us see (that is, is most available as light), but that of this light the energy is again most effective in a part to which the eye is most sensitive, while, of the small amount of energy employed by the gas in making us see at all, most (as shown by the height of the curve in the dark red) is spent in rays to which the eye is not sensitive, and which give the gas its well-known inferiority in quality (of color) to sunlight, even where the quantity is the same.

Similar curves obtained for the electric light would be interesting, but I have not undertaken them.

We are accustomed to indicator and other diagrams in the use of the steam-engine, showing us how our energy is being generated; but it is singular that so little has been done in the present direction in showing us with what economy it is being employed. I think interest attaches to these curves from a purely scientific stand-point, and they were made with no ulterior purpose. Yet in looking at them I can but be so impressed with their utilitarian applications that I will ask leave to make a remark in conclusion with reference to this.



Distribution of radiant energy in the spectrum of the sun.

Distribution of radiant energy in the spectrum of an argand gas-burner.

The gas-plant of this country is said to be some $30,000,000; and (except so far as it is used in heating) it appears from what has just been said, that it is mostly wasted as compared with the results possibly attainable, and in the sense that it does not realize one one-hundredth of what an ideally perfect lighting-agent might get from the coal now used. Though this ideal light will never be fully realized, it is undoubtedly possible to do what

we see actually done in sunlight; and thus whoever can, without altering the quantity, effect this change in the quality of the radiation from gas, will add millions to the national wealth. S. P. Langley.

THE NEW-YORK AGRICULTURAL EXPERIMENT-STATION.

The weekly bulletins of the New-York experiment-station, although "intended to inform the public of progress at the station rather than to give complete results," nevertheless contain some matters of interest.

Seeds. — A series of weighings on light and dark colored seeds of several kinds showed, that, in every case, a hundred dark-colored seeds were heavier than the same number of light-colored seeds. The dark-colored seeds were also found to contain a larger percentage of seeds capable of germination. Sprouting-trials with onion-seed of different ages indicated that seed over two years old is of little value. Confirmation was obtained of the results of Will on the regermination of seeds, reported on p. 176 of Science. Out of a hundred kernels of corn, eight germinated for the fifth time after drying in the air. Both field-experiments and sprouting-trials showed a decided superiority, as seed, of corn taken from the tips of the ears over that taken from the butts or the middle.

Potato-culture. — The terminal eyes of the potato were found to germinate more promptly and vigorously than the basal eyes. The best crops were obtained, and at the least expense of seed, by cutting the potatoes to single eyes, and so cutting them that each eye retained a portion of the tuber extending as far as possible towards the central axis. Each eye may be regarded as the terminal bud of a branch extending from the central stem; and the potato should be so cut that each bud may retain all, or nearly all, of its branch. The conditions favoring the production of potatoes seem to be moisture and coolness for the roots, and warmth and dryness for the tubers. Culture which supplied these conditions, such as ridge-culture, and, still more, covering the seed-potatoes with four or six inches of sand, gave a large increase over level culture.

Root-development. — By excavation and washing, the development of the roots of several species of plants has been traced. Corn seemed to have two systems of roots, — one of fibrous roots, developing chiefly in the upper and warmer layers of the soil; and the other of coarser roots, passing downward into the subsoil. The hypothesis is advanced, that the former system serves mainly to supply the plant with ash ingredients, and the latter with water, and perhaps nitrogen. Wheat and potatoes appear to be deep feeders, developing their roots more abundantly in the lower and cooler layers of the soil. Tobacco, on the other hand, is a shallow feeder, like corn.

Feeding-experiments. — A single determination of the digestibility of corn-ensilage gave the following percentage results: —

Proteine	51.89
Fat	79.17
Crude fibre	60.91
Nitrogen free extract	67.59

The figures for proteine particularly are lower than those given in Kühn's tables of digestibility; and the conclusion is drawn, that the process of ensilage has decreased the digestibility of this ingredient. The conclusion is, however, entirely unwarranted; for the figures simply show that the ensilage was less digestible than Kühn's corn-fodder, but show nothing whatever about the digestibility of the corn-fodder of which this ensilage was made.

A series of feeding-experiments on milk-cows was carried out, the fat in the milk being determined chemically, while, at the same time, the butter obtainable from it was determined by actual churning. The interesting result was reached, that, with different rations, the amount of butter fluctuated much more than that of the total fat: in other words, the feeding seemed to make a difference in the completeness with which the butter could be extracted from the milk. A ration of shorts and hay gave the best results in this regard. Other interesting minor results were obtained, but the main object of the investigation is not very apparent from the account given in these bulletins. The coarse fodder was eaten *ad libitum*, the amount of water drunk was not regulated, and no sufficient data are here presented for a comparison of the different rations. It is to be presumed, however, that some of these deficiencies will be supplied in the formal report of the station.

An analysis of the milk of fatigued cows showed that it was quite phenomenal in character, the total solids being nearly a third greater than the normal amount, and the increase being nearly all in the fat.

H. P. Armsby.

CLASSIFICATION OF ISLANDS.

A. Kirchhoff (*Kettler's zeitschr. wissensch. geogr.*, iii. 169) presents some criticisms on Peschel's and Wallace's work in this direction, and proposes the following table. A, Festländische inseln: *a*, Abgliederungsinseln; *b*, Restinseln. B, Ursprüngliche inseln: *a*, Submarin enstandene vulkanische inseln; *b*, Aufschüttungsinseln; *c*, Nichtvulkanische hebungsinseln. The first group includes those derived from a continental land-mass, either by submergence or seashore erosion, the latter being uncommon. Its first subdivision (dismemberment-islands?) are found along the borders of existing continents, and are very numerous. The second subdivision (remnant-islands?) would include the last surviving summits of a drowned continent; but no examples are surely known, unless those of the Antarctic Ocean belong here. These continental islands might be of volcanic rocks, for the higher points of many existing continental districts are of volcanic origin: they are not necessarily of varied geological structure, as described by Wallace. Witness the monotonous low quaternary islands along the German seacoast. And, while it is true that land mammalia and amphibia are wanting on islands of the second group, it is an error to say, with Wallace, that they are always present on those of the first. Wallace recognizes that elevation, after a complete though short submergence, would reveal the island bereft of its earlier continental fauna, but finds no examples of such a result. Kirchhoff adduces the Halligen Islands of the North Frisian group as such examples; for their low surface is frequently submerged by high winter tides, leaving only the huts crowded on artificial mounds above water. They have no mammals (except the domestic); moles are unknown in their green meadows; nor have they toads or frogs. Larger examples of the first group are seen in Greenland and the archipelago north of British America; in the West Indies, once connected with South America, Florida being of comparatively modern extension towards Cuba; New Guinea; and Borneo.

Madagascar and New Zealand are of older separation, the latter approaching the *restinseln*.

The term 'oceanic' is discarded for the second group, because islands may be formed *de novo* close to continental shores; but the term proposed ('original') is not altogether satisfactory, as it does not express precisely what is meant. The first subdivision (volcanic islands) contains the most important examples, which have sometimes, from their considerable age and altitude, acquired peculiar and local organic forms. The second subdivision (heaped-up islands) includes those of coral and of sand, on which the dry surface is due to wave and wind action. These are all low and monotonous. The third subdivision includes portions of the sea-bottom laid bare by non-volcanic action, either by local elevation "or by withdrawal of the sea formerly held at a higher level by the local attraction of mountains or ice masses that have now disappeared." A single example of recent formation is given, — the so-called 'Gulf-stream island,' northwest of Novaya Zemlya, where the Dutch navigators of 1594 found a sand-bank in seventeen fathoms of water. Peschel's error of placing the Japanese and Philippine islands among the volcanic is corrected: they are included among the continental, as both contain a series of old non-volcanic rocks.

W. M. DAVIS.

LETTERS TO THE EDITOR.

A new form of battery-cell.

IN the ordinary voltaic element, two solid plates are acted upon unequally by one or more liquids. About three years ago, it occurred to me to construct a battery-cell with three non-miscible liquid strata, and no solid plates; which I did, as follows: in a small beaker-glass I placed successively layers of mercury, dilute sulphuric acid, and a solution of iodine in ether. Upon connecting the uppermost and lowest layers with insulated wires, and introducing a coarse galvanometer into the circuit, I obtained evidence of a fairly strong current of electricity. Having neither time nor opportunity to pursue the matter further, I put it on record now in order that any student who happens to be interested in the subject may carry out the investigation. Theoretically, a three-liquid cell is interesting, because its internal resistance ought to diminish with rise of temperature. In this respect it might be very different from the usual voltaic elements. Possibly a combination of solid plates with the upper and lower liquids might give a cell having an internal resistance constant for varying temperatures. F. W. CLARKE.

Correcting compass deviation.

Some years ago, frequently recurrent shipwrecks from magnetic disturbance in the Gulf of St. Lawrence directed my attention to the subject of improving the mariner's compass, or supplementing it in some way which would make its indications trustworthy. The causes of the shipwrecks which I have mentioned seemed to be deposits of iron ore near the shore, so extensive in their area as to render the compass-reading false and misleading. The problem of improving the compass is an important one; for, apart from such risks as those which beset navigation in the Gulf of St. Lawrence, the deviation on board ship due to the presence of iron in the structure or cargo of the vessel is an element of some uncertainty, and danger even, when all the devices known to the mariner's art are used to correct the readings.

My first attempt was to so dispose a series of small flat magnets, fastened across a strip of aluminum, that the strip as such, when poised at its centre, pointed east and west.

Poised concentrically with the strip at such a distance as to avoid mutual influence, I placed a light magnetic needle of a length equal to that of the strip. When strip and needle were near enough to a piece of iron to be attracted by it, one of the two acute angles formed by them indicated the position of the disturbing iron; and this inclination at an acute angle promised to be of value in solving the problem of correcting compass-readings. But magnetic influence on the large scale which prevails on shipboard proceeds from distant centres along large curves, in which terrestrial and local forces merge, which are not attractive, but simply directive; so that when I tried my device on a steamer under very favorable experimental circumstances, as the magnets, large and small, were directed into curves so great as to be practically straight lines, the needle and strip were always at right angles with each other. Were it feasible to use a very long magnetic strip at sea, my device might be available; but, so long as ships roll and pitch on the ocean's unruly surface, the dimensions of the ordinary compass must remain as they are. Since abandoning the fragile little model which I launched with some expectations long ago, I have frequently reverted to the problem it was intended to solve; and it has occurred to me, that were an electro-magnet poised so as to be in constant and free communication with a battery, and were it possible to make it, when desired, so intense in its power that its induction affecting the iron of ship or cargo should increase the deviation which, when less intensely excited, would affect it, then the direction of the deviation would be, of course, known by the direction of the increase of that deviation, and the problem of correcting the compass-reading would be advanced a step. The intensity of the electro-magnet would yield such results as a long (impracticably long) magnetic strip. The electro-magnet would require to be so constructed as to be capable of developing the utmost intensity possible; and the current sent through it should be controllable at will, so that the indications at moderate and highest intensity might be compared. I have neither the skill nor opportunity to carry out the suggestion here given, and publish it in the hope that some competent man of science may be able to embody it in a practical and useful form. GEORGE ILES.

Montreal, May 25, 1883.

MAINE'S EARLY LAW AND CUSTOM.

Dissertations on early law and custom. By Sir HENRY SUMNER MAINE, K.C.S.I., LL.D., F.R.S. New York, *Henry Holt & Co.*, 1882. 402 p. 8°.

WHEN a new book by Sir Henry Maine is announced, we expect to have something to read worth reading. Nor have we ever been disappointed. The author of 'Ancient law' has always something interesting, suggestive,

instructive, to say. He gathers up the gist of contemporary thought, and presents it in a simple, lucid way, and always contributes something new from his own mind. The specialist finds, sometimes, a lack of definition, of exhaustive analysis, and here and there more or less serious errors. In spite of this, however, he must admit that we have no more interesting, no more instructive writings than these; that the reasoning is generally clear and sound; that the errors are, as a rule, incidental.

The present volume is divided into eleven chapters, to one or two of which notes of some length are appended. The first four chapters are devoted to early law in its relations with religion. Ancestor worship is discussed at length. We are told how the worship of father, grandfather, great-grandfather, and other ancestors, remembered or capable of being remembered, has among the Hindus a most elaborate liturgy and ritual. Our author thinks that wherever ancestor worship arose paternity must have been recognized. The father's power must, he tells us, have been antecedent to the practice of worshipping him. This seems a sound conclusion. When, however, we are told that ancestor worship preceded the existence of laws of inheritance, we demur. It is quite possible that ancestor worship originated as an expedient for preserving the knowledge of genealogical relationships, inheritances being determined according to these relationships. It has been very well said by Mr. Skene, that the genealogical table was to early society what the title-deed has been to society of medieval and modern times.

In chapters v. and vi. our author takes up the subject of royal succession and kingship in its connection with early civil justice. These chapters are very instructive. But on p. 131 we find the following statement: 'The past of the west lives in the present of the east.' This seems to us open to some criticism. Does our author mean to say that the gaps in the early history of the west may be filled up by importations of eastern custom? If so, we must make a protest. This is a very dangerous method, and not a scientific one. Without doubt, existing institutions in the east suggest to the student of institutions in the west hypotheses which he may profitably use *as hypotheses;* but they must not be used in any other way. The late Mr. Morgan was led into many errors by filling gaps in the history of one nation by extracts from the history of others. We remember our astonishment when we read his account of the Roman *gens*, in which he fills up the blank spaces of Gaius with importations from America. We are not a little pleased to see that Sir Henry Maine does not follow him in this. He says (p. 283), "The Agnati were a group of actual or adoptive descendants, through males, from a known and remembered ancestor: the Gentiles were a similar group of descendants from an ancestor long since forgotten." His note upon the *gens* is extremely interesting and valuable.

Chapter vii., upon the theories of primitive society, will, perhaps, be read with more interest than any other in the book. It is an argument to support the theory of patriarchal families against the theory of promiscuous hordes, against the theory of McLellan and Morgan. Have we any right to assume that the intercourse of men and women was in early times promiscuous? Sir Henry Maine thinks not. The first fact in sociological development is, according to his view, the family. Promiscuous intercourse, in so far as it has existed, he regards as due to the cultivation of unnatural, abnormal instincts, or else to a deficiency of women at certain times and in certain places. The origin of the family he traces to sexual jealousy, which he describes, rightly enough, as one of the strongest of animal instincts. In short, he takes very much the position which Mr. Darwin takes in his account of the descent of man. Sir Henry Maine defines the patriarchal family as the result of sexual jealousy indulged through power. This is a very good phrase. The whole argument, indeed, is vigorous and strong.

The house community (chapter viii.) is the next stage in sociological development. Then comes the village community, and lastly the manor. "Nor is it possible for me to doubt that the typical manor arose out of the village community." Our author makes this statement on p. 331. The inquiry suggests itself: Why should not the patriarchal family take the form of the manor, and why should not the village community grow up within the manor? Had we space, we should like to discuss this matter at length. Sir Henry Maine does not sufficiently consider the fact that the patriarchal family includes, usually, an assemblage of dependents and slaves. Why not derive the manor, with its tenures and its customs, out of this group, and the village community out of the manor?

The last three chapters of the book (ix., x., xi.) are devoted to the decay of feudal property in France and England, to classifications of property, and to classifications of legal rules. We regret that we have not space to speak more particularly of their contents. On the

whole, the book is singularly interesting, and well worth reading. We may be able hereafter to notice more in detail, and discuss more fully, some of the themes which Sir Henry Maine has made so attractive.

REPORT OF THE UNITED STATES ENTOMOLOGIST.

Report of the entomologist (of the department of agriculture) for the fiscal year ending June 30, 1882. By C. V. Riley. Washington, *Government printing-office*, 1882. 167 p., 20 pl. 8°.

THE report before us, which is extracted from the annual report of the department of agriculture, is not only the most voluminous contribution to economic entomology of the year just closed, but it presents the results of the most extensive investigations in this field during that period. The author, an entomologist of unusual ability and experience, was aided by a corps of very efficient assistants, and had at his disposal a large appropriation. This combination could not fail to produce important results.

It is to be regretted that the report reflects the character of too many other public documents, in that much is printed which has not the slightest permanent value; letters, for instance, from correspondents, often in full, which could have been advantageously reduced to half their extent; or accounts like that of the invasion of the army-worm in New Jersey, which is pleasant reading enough, and well suited to a popular journal, but out of place here in the form in which it is cast. Very different from these are the portions written by the entomologist and the members of his staff: these are direct, and to the point.

As the volume containing this report may be had for the asking, it will be in the possession of all who are especially interested in economic entomology. On this account, it is not worth while to refer, in this place, to each of the many topics discussed. A few of them are of general interest.

The circular which accompanied the seeds of Pyrethrum, that were distributed by the commissioner of agriculture, is reprinted, and is illustrated by two excellent colored plates representing the flowers and leaves of P. roseum and P. cinerariaefolium. The circular gives a *résumé* of what is known respecting the history of Pyrethrum, the method of preparing the powder, and the modes of using it. Dr. Riley adds reports from persons to whom seeds were distributed. Only a few persons succeeded in raising good plants. These were chiefly in the north. The failures were probably largely due to drought and bad seed. A report of experiments with the powder, by Miss Murtfeldt, is also given.

Acting under the direction of Dr. Riley, Mr. Hubbard experimented upon scale-insects with various insecticides, and especially with emulsions of kerosene and milk. These emulsions were the most efficient of the substances used.

Several insects infesting the rice-plant are described. The rice-grub is the larva of a beetle (Chalepus trachypygus). This insect feeds upon the roots of rice, and has done considerable damage to rice-plantations. Howard states that the larvae and adults are both destroyed by the 'harvest-water;' and consequently the breeding-places must be those fields which are not flooded, and the patches of volunteer rice. Therefore the insect can be easily kept in check, except where upland rice is grown. The rice-stalk borer (Chilo oryzaeellus) is a new lepidopterous insect described by Riley. The habits of the larva, which are indicated by the popular name, are reported by Howard.

Economic entomologists will note with especial interest the discovery of the larva of the 'corn bill-bug' (Sphenophorus robustus). This larva infests the stalks of corn at or near the surface of the ground. If, as is now supposed, the adult beetle hibernates in the stalk, ploughing up the stubble, and burning it, will be a simple remedy.

'The smaller corn-stalk borer' (Pempelia lignosella) is a new corn-pest which is very destructive in the Carolinas and Georgia.

In an article on the cotton-worm, a machine for spraying the cotton-plant from below is described, and illustrated by a full-page figure.

Embodied in this report is a part of a report on miscellaneous insects, made by Prof. J. H. Comstock to the commissioner of agriculture; the most interesting portion relates to lac insects, of which two species are described from Mexico and the adjoining portion of the United States.

MACGREGOR'S BALUTCHISTAN.

Wanderings in Balochistan. By Sir C. M. MACGREGOR. London, *Allen & Co.*, 1882. 315 p., illustr. 8°.

THIS is a rather loosely written narrative — with a tendency to slang expressions, such as 'green funk,' 'make tracks' — of a reconnaissance expedition undertaken in 1876–77, in company with Capt. R. B. Lockwood, who,

unhappily, died shortly after the end of the journey from the effects of exposure. There is a provoking lack of appreciation of geographical form, and a want of understanding of geological structure, that deprives the observations of much value; and the pen-drawings that illustrate the book in good number are extremely rough. Perseverance and energy are, however, apparent enough in the success of the expedition; and the itinerary notes as to roads, supplies, and water, have a great value for those who may have to repeat the author's journey in this desert country. The party entered from the southern coast at Gwadar; and, after traversing for some two hundred miles a barren region of flat valleys or plains abruptly broken by mountain ranges, they reached the desert interior basin, into whose depressions the Mashkel flows from the south; the Halmand and others, from the north-east and north; and several smaller temporary streams, from the surrounding or dividing ranges, forming salt plains or marshes (hamun) at the lowest points. This district is absolutely barren, and very flat, broken only by sand-ridges, or occasional rocky peaks that rise like islands over the level plain. The largest central depression, known as the God-i-zirreh, is a dry salt waste about seventy miles long east and west, and twenty miles wide, surrounded by a barren sandy desert; and the passage across the southern margin of this desolate tract, hitherto unexplored, to a point named Shah Godar, exposed the explorers to great hardships. Water was found there only by digging in the sand of a dry stream-channel (175–185). This was their farthest station; and from it they returned eastward to Jacobabad, in Sind. The people were found avaricious and untrustworthy: their towns were of the most forlorn description. The difficulty of learning local names was not small. The instructions given by a local official to a guide who was to accompany Macgregor were overheard by him: 'This sahib will ask you the name of every hill, every river, and every hut you see.' — 'What for?' — 'Heaven only knows! These sahibs always do that: they ask the name of every thing, and then write it down.' — 'But how am I to name all the hills?' — 'Call them any thing you like, and he will write it.' It seems, that while the people have names for the ravines that they follow, and for the stopping-places on them, they generally have no names for hills and ranges; nor have they any idea of the connection of mountains with each other, or of any system of drainage. Sand-hills are very numerous on the deserts; and, on the plain north of the Mashkel hamun, a peculiar form was noticed, provoking one of the few pieces of careful description in the book (p. 157). The examples were very numerous, and all closely alike; their form was crescentic, and the largest were sixty feet high at the middle of the curve, descending to the general level at the horns; the outer slope is 30°, and the inner 45° with a still steeper inclination at the outer side of the top of the ridge; they stand on a perfectly level plain, with the curve to the north or windward, and horns to the south. One would 'afford cover enough for a regiment or two.' The author imagines that some obstruction like a bush formed the nucleus about which the sand originally gathered. A sketch-map accompanies the volume; but there is often an unfortunate disagreement in spelling between it and the text. Table of contents and index are lacking.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

Strain of an isotropic solid. — Mr. Stearn has given a very brief method for obtaining the expression for the internal energy per unit volume of a strained isotropic solid. — (*Quart. journ. math.*, Feb.) T. C. [967

Elliptic functions. — Mr. Glaisher has given a series of integrals of functions depending upon elliptic functions. The paper is of such a character that it is impossible, in this place, to do more than refer to it. It may, however, be remarked that the set of integrals obtained constitutes a valuable addition to the known elliptic function formulae. A continuation of the investigations may be inferred from the manner in which the author has introduced the present article. — (*Quart. journ. math.*, Feb.) T. C. [968

Spherical triangle. — Professor W. W. Johnson remarks, that in the proof of the addition theorem in elliptic functions by means of a spherical triangle whose sides are ϕ, ψ, and μ, where $\phi = \operatorname{am} u$, $\psi = \operatorname{am} v$, $\mu = \operatorname{am}(u+v)$, and k is the ratio of the sines of the angles to the sines of the opposite sides, it is usual to state that the angle opposite to the side μ is obtuse, so that its cosine is $-\Delta\mu$, if the other angles are acute, so that their cosines are $\Delta\phi$ and $\Delta\psi$. This may be shown to be a consequence of the assumption that k is less than unity. The present note aims to show that the restriction, $k < 1$, may be removed, in accordance with which $\Delta\mu$ is always positive; proving directly, that, in all cases, the cosine of the angle in question is $-\Delta\mu$. It is further shown, in order to complete the proof, that the triangle from which the formulae are derived is possible for all real values of u and v, as well as k. — (*Quart. journ. math.*, Feb.) T. C. [969

PHYSICS.

Liquefaction of oxygen and nitrogen, and congelation of carbonic disulphide and alcohol. — On boiling ethylen in vacuo, Wroblewski and Olszewski obtained a minimum temperature of −136° C. With the temperatures thus obtained, which were measured with a hydrogen thermometer, experiments were performed on liquefaction and congelation. Under the pressures 26.5, 24.8, and 22.5 atmospheres, oxygen began to liquefy at the temperatures −131.6°, −133.4°, and −135.8°. It formed a colorless and transparent liquid with a well-defined meniscus. Carbonic disulphide congealed at −116°, and melted at −110°; alcohol became a viscous oil at −129°, and solidified at −130.5°; nitrogen formed a colorless liquid with a visible meniscus. — (*Comptes rendus*, xcvi. 1140.) C. F. M. [970

Electricity.

Alleged luminosity of the magnetic field. — Professor W. F. Barrett says, "It is well known that the late Baron von Reichenbach claimed to have discovered a peculiar luminous emanation arising from the poles of a magnet, resembling a faint electric discharge in rarefied air."

Prof. Barrett and several other gentlemen, members of a committee appointed by the Society for psychical research, have been making experiments with a view to proving or disproving the existence of the alleged phenomenon. No member of the committee appears to have been able to see the emanation; but the committee did discover, in some way not detailed, a certain gentleman, Mr. G. A. Smith, and a boy, Fred. Wells, 'an assistant in a baker's shop,' who each appeared able, in a room perfectly dark to other people, to see a faint glow, like a waving cone of light, at either pole of a strong electro-magnet, and to tell, by the appearance or disappearance of this glow, when the current was turned on or off by means of a commutator in charge of several gentlemen in an adjoining room.

Prof. Barrett seems to have taken various precautions to avoid deception, conscious or unconscious, on the part of the principal actors in the affair; but it is to be hoped the committee will not rest from its labors till it has found some means of making the alleged luminosity visible, not merely to bakers' assistants and other more or less irresponsible persons, but to trained scientific observers. — (*Phil. mag.*, April.) E. H. H. [971

ENGINEERING.

Theoretical mechanics. — Mr. George F. Swain presents an article upon the application of the principle of virtual velocities to the determination of the deflection and stresses of frames. An exact method of finding the elastic deflection in any direction of any point of a frame of any kind, due to Lamé, is first explained. The determination of deflection is in itself a problem of small importance. It finds its application, however, in the calculation of the so-called 'statically undetermined' structures, such as the continuous girder, and the arch with fewer than three hinges, where the forces acting depend upon the condition that the deflection of some point in the frame in some particular direction must be a given quantity. These structures are taken up in succession, and the general equations to be used in their calculation are given. Trusses with superfluous bars are next discussed; and a historical account of the literature of the subject closes the article. — (*Journ. Frankl. inst.*, Feb., March, April.) G. L. V. [972

Naval iron vessels. — The advisory board of the navy department reports in favor of fitting up the League Island navy-yard to build the iron and steel ships to be constructed. — (*Bull. iron steel assoc.*, April, 1883.) R. H. T. [973

Forced draught in steamers. — Experiments on the Satellite and Conqueror, reported by R. J. Butler to the Royal institute of naval architects, indicate that forced draught is not advisable on long runs, but that it is useful on runs of less than six hours. For such cases a fan draught is recommended. — (*Engineering*, March.) R. H. T. [974

Hydraulic machine-tools. — Mr. R. H. Tweddell describes to the British institute of civil engineers forms of machine-tools driven by hydraulic pressure. Riveting has long been practised with hydraulic riveters; hydraulic stamps and forging-presses are now made to do good work; machine-tools have been made by Armstrong; and an hydraulic system of power-transmission has been adopted at Penhouet, France. Portable hydraulic machine-tools are found to save greatly in floor-space, and to save power as well. — (*Engineering*, March 23.) R. H. T. [975

CHEMISTRY.

(General, physical, and inorganic.)

Borotungstic acids. — D. Klein prepared disodic borotungstate ($14\ WO_3 . B_2O_3 . 2\ Na_2O . 4H_2O + 25\ H_2O$) by adding the required amount of boracic acid to neutral sodic tungstate. Although other salts were prepared from the sodium salt, several attempts to separate the acid in a state of purity were unsuccessful. The mother liquors of the sodic borotungstate contained a sodium salt of tungstoboric acid, which was precipitated as the barium salt by adding baric chloride. This acid, which is comparatively stable, was prepared by treating the barium salt ($9\ WO_3 . B_2O_3 . 2\ BaO + 18\ H_2O$) with dilute sulphuric acid. Tungstoboric acid proves to be a convenient reagent for characterizing the alkaloids and peptones. With even a minute quantity of the salts of quinine, cinchonine, strychnine, morphine, and codeine, it gives a white precipitate. With peptones it behaves like phosphotungstic acid. The author finds that cadmic tungstoborate is well adapted for use in the mechanical separation of the mineralogical elements of rocks in petrography. In the solid form, its specific gravity is 3.28, and a liquid may be obtained from it of any density between 1 and 3.8. At 75°-80° it melts in its water of crystallization, giving a sirupy liquid of sufficient density (3.7) to float garnet or spinel. — (*Ann. chim. phys.*, xxviii. 350.) C. F. M. [976

Action of chlorine on certain metals. — When thoroughly dried chlorine was allowed to remain in contact with Dutch metal, A. Cowper found, that, apparently, no chemical action had taken place at the end of three months. On introducing even a trace of moisture, the chlorine was rapidly absorbed. Zinc and magnesium were not attacked by the gas after it had stood several days in contact with fused calcic chloride. Silver and bismuth were acted on slowly; while tin, antimony, arsenic, and mercury were attacked with the same energy as in the moist gas. In the dried gas, sodium remained untarnished. Potassium, at first bright, became slowly covered with a purple film, probably of the subchloride. — (*Journ. chem. soc.*, ccxliv. 153.) C. F. M. [977

Drying gunpowder magazines. — It having been officially recommended that chloride of *lime* should be used for removing the moisture from magazines, Prof. Munroe held that this was due to a con-

fusion of the terms 'chloride of *lime*' and 'chloride of *calcium*.' He claimed that chloride of *lime* was both inefficient for removing the moisture, and deleterious in its action on the powder. Experiments were made which showed, that, while chloride of *lime* absorbed 30.70 % of water, chloride of *calcium*, exposed under the same conditions, absorbed 60.50 %. Again: two samples of a gunpowder were treated with water. One sample was exposed to the air; the other, for the same time, to the gas liberated from chloride of *lime* by the action of $C O_2$. In the first, .16 % of sulphur was found as sulphate; in the second, 1.60 % existed as such. — (*U. S. nav. inst.; meeting* May 10.) [978

Purification of drinking-water. — Dr. F. Roeder finds, that from three to six drops of officinal dyalized iron will carry down the solid matter suspended in one litre of muddy water from the Ohio River. About two drops of the reagent are required to clarify water colored with one drop of blood. Albuminoids are removed by dyalized iron; perhaps, also, the other unwholesome organic contamination. For purification on a large scale, ferric chloride and sodium carbonate may be used. The precipitate may be removed by filtration or decantation. — (*Dep. sc. arts Ohio mech. inst; meeting* May 10.) [979

Formation of crystallized vanadates by fusion. — By heating vanadic acid with sodic bromide and a small quantity of baric chloride, A. Ditte obtained baric vanadate, $Ba (VO_3)_2$, in small transparent crystals. Strontic vanadate was prepared by fusion of the acid with sodic bromide and strontic bromide. Vanadates of lead, cadmium, zinc, manganese, and nickel, were formed in the same way. — (*Comptes rendus*, xcvi. 1048.) C. F. M. [980

A compound of phosphoric and silicic oxides. — MM. Hautefeuille and Margollet observed the formation of the compound $P_2O_5SiO_2$ when metaphosphoric acid was heated to fusion, and silicic oxide added to the fused mass. The silica was prepared by decomposing silicic fluoride with water. — (*Comptes rendus*, xcvi. 1052.) C. F. M. [981

Action of carbonic oxide on the vapor of water. — When carbonic oxide was heated with water to 250°-275° in a closed tube, L. Marquenne noted the formation of carbonic dioxide and formic acid in small quantity. From the result of this experiment, the following conclusions were drawn: 1. Carbonic oxide is a stronger reducing agent than hydrogen; 2. Carbonic dioxide is permanent in presence of hydrogen at temperatures below the point of its dissociation; 3. The carbonic dioxide and hydrogen formed during the decomposition of formic acid by heat is the result of a secondary action between carbonic oxide and water. — (*Bull. soc. chim.*, xxxix. 308.) C. F. M. [982

GEOLOGY.

Geology of Buffalo Peaks, Colorado. — These rise in the highest point 13,541 feet above sea-level, and consist of a narrow, curving ridge, with a peak at each end. The upper portion is composed of andesite (hornblendic), and the lower of tufas of various kinds, the whole resting on granite and upturned sedimentary rocks. It is interesting to note that Mr. Emmons states, that, in the present condition of microscopical lithology, the earlier classification of many rocks as trachytic or andesitic are rendered doubtful, and that "many facts already observed by us suggest a doubt whether von Richthofen's classification of volcanic rocks will be found to hold good everywhere in Colorado, and even that many modifications of the relations of the older eruptive rocks, as well as those of tertiary age, may be found necessary." — (*Bull. U. S. geol. surv.*, i. 11.) M. E. W. [983

Thickness of the continental glacier. — T. C. Smock, of the New Jersey geological survey, has examined the vertical distribution of marks of glacial action in northern New Jersey and southern New York, and concludes, from the difference in altitude of closely adjoining drift deposits, bowlders, and scratches, that the ice must have been from two to four hundred feet thick along its southern margin, from Perth Amboy to the Delaware. To determine its surface slope, the Catskill Mountains were studied, and marks of glacial action found up to altitudes varying from 2,500 to 3,250 feet. Above this, the rock outcrops are more precipitous, even on the northern side, and the detritus is local and angular, and hence it is concluded that the ice reached no higher. From these figures, a surface slope southward of less than half a degree, or under thirty feet to a mile, is obtained, and depth sufficient to submerge the Highlands and Shawangunk Mountains of southern New York. — (*Amer. journ. sc.*, xxv. 1883, 339.) W. M. D. [984

Lithology.

Hypersthene-andesite. — Dr. W. Cross's microscopic examination of some of the supposed augitic andesites in rocks from Buffalo Peaks (see **983**) showed that the pyroxenic mineral was of two kinds, hypersthene and an unknown triclinic one, as determined by their optical characters and a chemical analysis of the former. Since a notice of an abstract of his work has already appeared in Science (see **375**), only some omitted points will be noticed here.

Besides the position of the optic axes, the chief optical distinction between the hypersthene and the augite (?) is the pleochroism of the former, and the absence of it in the latter, according to Rosenbusch and Cross. A hasty examination of some andesitic rocks by the present writer, since this bulletin was seen, has shown that the pleochroic mineral in some of his sections is not orthorhombic; and from his past studies he can testify, that, if pleochroism is to be relied upon at all, then hypersthene is widely distributed in andesitic rocks, both in North and South America, as well as in gold-bearing and other sands. Dr. Cross claims, that, in all but two of the augite andesites described by Zirkel from the Fortieth parallel collection, the predominating pyroxene is the hypersthene. Cross is in doubt whether the triclinic pyroxene is a distinct species, or augite showing anomalous optical action. Following the current classification of the andesitic rocks which groups them according to their pyroxenic constituent (including hornblende and mica), we shall have enstatite, hypersthene, diallage, augite, hornblende, and mica andesites, — six different species, — to say nothing of the many made out of the older and more altered andesitic rocks. It would seem, that, in the pyroxene group, a similar mixed series exists as has been found in the felspars, with three different crystallographic systems; and the same difficulty may be expected in their use in rock classification.

The paper is a well-written and very valuable contribution to the mineralogy of the andesites; and, from the common lithological stand-point, the conclusions drawn appear to be just. The freedom of opinion, accompanied by the rapid change of views since the survey was organized in 1879, as manifested in the recent publications, is a most encouraging and promising sign for the future. — (*Bull. U.S. geol. surv.*, i. 19.) M. E. W. [985

GEOGRAPHY.

(North America.)

The Blue Hills of Massachusetts, near Boston, are roughly mapped by E. G. Chamberlain; and the view from their highest summit, six hundred and thirty-five feet, is described in detail. Among the visible points are Holt's Hill in Andover, and Manomet in Plymouth, each about thirty miles distant; Wachusett, forty-four miles; and Grand Monadnock, sixty-seven and one-half. One hundred and twenty-five villages were identified, and many others were sighted. — (*Appalachia*, iii. 122.) W. M. D. [986

Eastern Cuba. — W. O. Crosby describes the topographic features of eastern Cuba as dependent on the following structural elements: eruptive rocks, making sharp, serrated mountains, of which the Pico de Tarquino exceeds eight thousand feet; these are flanked by ridges of slates and schists, generally of later date, as at least some of the eruptives penetrate them in tongues and dikes; finally, there are coralline limestones in terraces of marked uniformity for considerable distances along the shore. The terraces stand along the northern coast at altitudes of thirty, two hundred to two hundred and fifty, five hundred, and eight hundred feet. The lowest is most distinctly of coral origin, and closely resembles the reef growing in the neighboring sea. Passing up to the older ones, the limestone becomes more distinctly crystalline, and the corals and shells are in great part obliterated; but the resemblance, coupled with the progressive change, serves to show identity of origin. Some of the terraces slope away from their precipitous front toward the mountains, and are hence regarded as old fringing reefs. The highest limestone forms the upper thousand feet of a bold mountain called *el Tunque*, eighteen hundred feet high. The harbors along the present shore are roughly circular openings behind a narrow deep entrance in the outer reef; the streams back of the harbors flow over detrital fillings of their valleys. All these features are taken together as proof of oscillating variations in the level of Cuba, but in which the upward movement has predominated so strongly as to produce an elevation of two thousand feet in post-pliocene time. The great depression at which this irregular elevation began would have reduced the Greater Antilles to a few small rugged islands, and thus account for the absence of large land-animals, which were common enough there in pliocene and earlier times. [It may be suggested that the movements of depression, here supposed to have interrupted the general elevation, would be more fully proved if it were shown that the old reefs could not have grown outward from the shore during times of rest in the island's rising. The comparatively small and recent depression shown by the silted stream-channels does not necessarily imply previous depressions as well.] — (*Appalachia*, iii. 129.) W. M. D. [987

(Africa.)

Flooding the Chottes. — In spite of the discouragement of an adverse report by the French government commission, Commander Roudaire has succeeded, with the aid of M. de Lesseps, in forming a company to furnish the funds for his project, and in December last went with a party of engineers to sound the lowland by borings between the Mediterranean and the Chottes. As far as reported, only sand was found, which promises an easy construction for the canal that is to form '*la mer intérieure Africaine*.' In March M. de Lesseps was to join the party to make plans for the further work. — (*Bull. soc. géogr. Marseille*, 1883, 36.) Later reports announce the return of Mr. de Lesseps with the conviction that the project can be successfully and advantageously carried out. W. M. D. [988

Stanley and de Brazza. — M. Savorgnan de Brazza is well sustained by the French government in his projects of exploration. An appropriation of 1,275,000 francs was voted him recently by the chamber of deputies, — 449 ayes to 3 noes, — and confirmed by the senate; and a part of his expedition, under M. de Lastours, has already sailed from Liverpool. He plans to enter the interior from a point on the coast north of the Kongo, and is convinced that he will find a valley there, crossing the mountainous continental border, that will allow the easy construction of a railroad to his inner stations on the river. The expedition is to have a most peaceful character, and is placed under the patronage of the ministers of foreign affairs and of public instruction; and 65,000 francs are to be devoted to buying gifts for the African chiefs, who are to be conciliated. In the mean time Stanley, who was thought to be in Spain or at Nice regaining his health, has already sailed for the Kongo with 3,000 tons of merchandise, and, according to English despatches, has already advanced well up the river with 230 men brought around the Cape from Zanzibar by Capt. Cambier. — (*Bull. soc. géogr. Marseille*, 1883, 44.) [989

The rights of Portugal. — The claim set up by Savorgnan de Brazza for French possessions on the Kongo, from which the quarrel between him and Stanley resulted, has aroused Portugal to assert her rights in western Africa. An able treatment of the 'Question of the Kongo' has lately been issued in Portuguese and in French by a committee of the Geographical society of Lisbon, in which they claim all the western African coast between lat. 5° 12′ and 18° S., and an extensive but undefined territory inland, in right of discovery, possession, and recognition. Their pamphlet begins with examples of international decisions bearing on the question, and then, with much care, discusses the evidence of discovery from 1464, of possession from a little later date, and of recognition of their rights by other nations, France among the rest. It concludes with a note from Secretary-Gen. Strauch of the International African association, dated Brussels, Oct. 25, 1882, stating, that, as far as he knows, de Brazza had a mission from the French committee of the association, and funds from the French government; while Stanley was in the service of the international committee, and was charged with founding scientific and hospital stations on the Kongo, but not with acquiring territory. — (*Soc. géogr. Lisboa. La question du Zaire. Droits du Portugal*, 1883.) W. M. D. [990

BOTANY.

Exudation of water from leaves. — By an examination of plants in very early morning, Volkens has greatly extended the list of those from which liquid water exudes. He describes the water-pores of 150 species, distributed through 91 genera and 36 families. He appears to have exercised great care to avoid errors from the possible presence of dew upon the leaves. In order to ascertain the amount of water in the stems of the plants exhibiting this phenomenon, he made use of double scissors, by which a piece about half an inch in length could be cut out at one stroke, thus diminishing the chances of affecting the relative amounts of air and water in the part at the moment of separation. By the use of this simple contrivance, he has shown that the amount of air and water in a vigorous plant varies considerably during the day, even when the specimen is kept under uniform exter-

nal conditions. Most of his observations were made upon wild plants in open fields. — (*Ber. des konigl. bot. gartens, Berlin*, 1883.) G. L. G. [991

Pollination of Araceae. — The contrivances which secure crossing in several species of Dracunculus and Arum have been restudied by Arcangeli, who finds the pollinators of D. vulgaris to be scavenger beetles, chiefly species of Dermestes and Saprinus, while D. canariensis is thought to be fertilized by Cetonia and other flower-beetles. On the other hand, D. crinitum and A. italicum depend upon diptera; the former relying on Anthomyia and related genera, while the visitors of the latter are mainly species of Psychoda and Sciara. The characteristic odors of the several species, which serve to attract the particular insects best fitted to carry their pollen, and numerous structural peculiarities utilizing their visits, receive special attention. A few observations on the rise of temperature in the aroid spathe, and a list of references on the subject, are also given. The writer introduces two convenient terms — osmophore (*οσμη, φερειν*) and anthophore (*ανθος, φερειν*) — to designate respectively the upper and lower parts of the spadix. — (*Nuov. giorn. bot. ital.*, Jan.) W. T. [992

Anther of Roscoea. — Lynch describes and figures the lever-like stamen of Roscoea purpurea, which, like the similarly hinged anthers of species of Salvia and Calceolaria, is so pivoted as to have the polliniferous end depressed by, and brought in contact with, visiting insects. In this case, however, the flexible style is carried with the moving stamen, so that its stigma receives pollen, previously collected on the back of the insect, at the same time that a new load is being taken. The contrivance has previously been described by Delpino. In this connection, the curious suggestion is made that Salvia Grahami, the flowers of which are closed by the anther-levers, as in S. fulgens, etc., is pollinated by small insects, which, having forced their way into the flower, can escape only by creeping out over the upper end of the lever, where they are dusted with pollen, beside coming in contact with the stigma. The species, however, is apparently ornithophilous. — (*Journ. Linn. soc., bot.*, xix.) W. T. [993

Withdrawal of pollinia in the bee orchis. — That the spontaneous removal of the pollinia from the anther-cells in Ophrys apifera is due to something besides gravity, would appear from the observations of Clark, which, however, do not give a very clear idea of the process. — (*Journ. bot.*) W. T. [994

ZOÖLOGY.

Mollusks.

Snails used for food in Spain. — Kobelt has issued for private circulation a reprint of his journey, 'Nach den säulen des Hercules,' for malacological investigations. Among other interesting matters in this entertaining brochure, we find an account of the snail-market at Valencia, and numerous references to the consumption of these mollusks for food, not only in the Iberian peninsula, but in Morocco and Algeria wherever the south Europeans have colonized. The Spanish do not merely eat the large vine-snail (H. pomatia), which is made use of in South France and Germany, but appear to consume all kinds which are large enough to be worth the trouble of collection, except a few (Helix Gualtieriana, Leucochroa candidissima, and L. baetica) which are reckoned tough and unwholesome. The women who deal in this kind of lenten food are called caracoleras (from *caracole*, a snail), and congregate in a small open square used as a snail-market, cry their wares loudly, and, to convince customers of the good quality of the animals heaped up before them alive in large baskets, crack the shells open with their teeth. Helix alonensis, the serrano or mountain snail, is considered to be the most delicate of all, and comes from the vicinity of the Vega. From Mallorca is imported H. lactea, which is found throughout southern Spain; and in the Valencia market Kobelt also obtained H. Dupoteliana, vermiculata, and aspersa. They were valued at about forty cents a hundred; and, in spite of prejudice, he felt compelled to acknowledge, that, when properly dressed, some of the kinds were really of delicate flavor. They are cooked, shells and all, in a broth with onions; extracted, stewed, and replaced in the shell to be served; or steamed with rice. Strangers rarely partake of these peculiarly Spanish delicacies; which, nevertheless, are so much esteemed by that nation as to be imported for home use, and even exported for the benefit of Spanish colonists in other parts of the Mediterranean. — W. H. D. [995

Extraordinary Eulima. — That indefatigable collector, Henry Hemphill, has recently sent to the National museum, among other treasures of the sea from Florida, two specimens of a Eulima about 2.5 mm. long, which, except when viewed by transmitted light, have a perfectly sooty appearance. This for the genus is something never before known, and more remarkable in that group than a black swan among birds. — W. H. D. [996

Arctic mollusks. — In the year-book of the recently established Tromsö museum, the land and fresh-water mollusks of the arctic regions of Norway are enumerated, with descriptions of several interesting varieties by Miss Bergithe Esmark of Kristiania. The author, whose paper is printed in English, reviews previous catalogues, and enumerates thirty-five species in arctic Norway, twenty-seven in West Finmark, seventeen in Nordland, and fourteen in East Finmark. In Tromsö, in about latitude 70° north, Clausilia bidentata has been found, and also Helix arbustorum. H. pygmaea reaches 70° 20′ north latitude, which exceeds by several degrees its most northern range in Siberia, and probably elsewhere. Our own Zoögenetes harpa, discovered successively in the United States, Kamtchatka, eastern Siberia (Dall), and the Amur region, is now found extending to the shores of the Arctic Ocean at the northern extreme of Europe. Besides the shell-bearing forms, there are also three Limaces; and the Margaritana margaritifera is in some places common, and frequently produces pearls. — W. H. D. [997

North German miocene. — Koenen continues his researches on the fauna of that formation in a paper covering the holostomatous and tectibranchiate gastropods, the cephalopods and pteropods. He describes and figures many new forms. — (*Neues jahrb. min.*, ii. 223.) W. H. D. [998

Worms.

Segmental organs of leeches. — In continuation of the researches of Bourne and Lang, Oscar Schultze has carefully studied the segmental organs in five species of leeches. These structures are long convoluted tubules, presenting at least three divisions, — the terminal duct, which opens exteriorly; the middle piece, containing a simple canal; the inner part, with branching canals. In no case was the canal found to begin with a ciliated funnel, as in many chaetopods. The parts are difficult to unravel because they are much convoluted, and most of the middle and part of the terminal division is covered by the inner division. The beginning of the inner

division is, however, isolated, and does not cover other parts. In Clepsine this free part consists only of a single row of cells joined like beads on a string. The essential peculiarity of these organs is in the perforated gland-cells, of which there are two forms. The simpler form is found in the middle portion of the organ. Each cell is perforated by a lumen, which communicates and is continuous with the lumen of the next cell, so that a single string of cells forms a continuous canal. A more complicated form exists in the middle division, in that the cells are perforated by branching canals, which are continuous from cell to cell. Between these extremes certain intermediate forms have been observed. — (*Arch. mikr. anat.*, xxii. 78.) C. S. M. [999

Pilidium larva. — In the last issue of Studies from the biological laboratory of the Johns Hopkins university, E. B. Wilson describes the pilidium larva of a nemertine. It is helmet-shaped, with the convex side more elevated than usual, and crowned by a small flagellum. The anterior margin of the bell is prolonged into four short arms, behind which is a deep sinus, followed by two arms on each side, the anterior largest of all. The young nemertines are developed in a folded position within the lower and posterior part of the larval envelope, and are distinctly segmented posteriorly. — (*Amer. nat.*, Jan.) C. S. M. [1000

VERTEBRATES.

Direct action of alcohol on the heart. — A paper on the above subject was read by Prof. H. Newell Martin, based on researches carried out by him in conjunction with Mr. L. T. Stevens. The experiments were made on the hearts of dogs, completely isolated from all the rest of the body but the lungs. The pulmonary circuit was intact; but only the coronary system of the heart was left of the systemic circulation. The rest of the greater circulation was carried on through an artificial arterial and venous system. The heart was uniformly supplied with defibrinated dog's blood. The authors found, 1°. That when the blood supplied to the heart contained by volume ¼ of 1% of absolute alcohol nearly always, and when it contained ½ of 1% invariably, the work done by the left ventricle, as measured by the quantity of blood pumped out in a minute against a given resistance, was greatly diminished. 2°. If the alcoholized blood were not supplied too long the heart could be restored by feeding it with pure blood. 3°. The diminution of work was due to an alteration in the physical properties of the cardiac muscle, in consequence of which the organ expanded greatly. At the height of its systole it almost completely filled the pericardium, and during diastole had no room to expand and take in more blood: hence it had little or none to pump out at the next systole. 4°. The contractile power of the ventricle is not at first affected, since, if the pericardium be cut away so as to give the dilated heart plenty of room for its expansion, as much blood is pumped around as if no alcohol were administered. If, however, the alcoholized blood be supplied to the heart for a considerable time, as ten or fifteen minutes, the muscular power of the ventricle is diminished. 5°. Alcohol in the above-named proportions does not affect the rate of beat of the isolated heart. 6°. An experiment made on a total abstainer to whom half an ounce of absolute alcohol, diluted with water, was administered, showed that the drug had no influence on the pulse rate, although the dose was sufficient to cause dizziness in the person experimented upon. — (*Med. chirurg. faculty Maryland; meeting* April 20.) [1001

Reptiles.

Lingual glands of the frog during secretion. — The important discovery of Heidenhain, that the cells of the submaxillary glands undergo visible changes during their secretory activity, has led to numerous investigations on other glands. Among these is Biedermann's research on the lingual glands of frogs. From his prolix and inchoate article we extract the following conclusions: the glands are closely related to the mucous salivaries in character. They are follicular, with their lower ends dilated. The gland-cells have an outer nucleated zone, and an inner granular zone: the former, after the cells are hardened, is stained dark by carmine; in the inner zone, reagents cause the granules to swell, so that the zone becomes hyaline, and, as it does not stain, in sections it appears clear. To call forth the secretion, the glosso-pharyngeus of one side was irritated for from three to five hours; the tongue was then hardened in absolute alcohol; and, in transverse section, the resting glands were seen on one side, the active ones on the other. During secretion the granules are poured forth, and probably converted into mucin; for they are not mucin while *in situ*, because logwood does not stain them. In consequence of the exit of the granules, the cells become narrower (but retain their height), so that the glands are smaller. In the inner zone there is visible only a granular protoplasm, the intercellular walls are less distinct, and the so-called 'stützzellen' can no longer be well seen. No evidence was had to show that there was a production of new cells during secretion, such as Heidenhain has maintained occurs in other glands; nor do any of the cells appear to be destroyed. — (*Sitz.-ber. akad. wiss. Wien*, lxxxvi. iii. 67.) C. S. M. [1002

Maturation and segmentation of the reptilian ovum. — C. F. Sarasin gives a preliminary notice of his researches on this subject. The most important point is the method of development of the yolk elements out of fine granules, and the continuation of this process during segmentation. The destiny of the nucleus was not satisfactorily ascertained, for the nucleus 'disappeared.' The segmentation differs from what has been hitherto observed in meroblastic vertebrates. — (*Biol. centralbl.*, iii. 108.) C. S. M. [1003

Mammals.

(*Man.*)

The lines on the human skin. — The skin is covered by countless fine furrows. Lewinski has studied these, and arrived at the conclusion that they are bends (*knickungen*) produced by the movement of the skin, either over the joints, as at the knuckles, or directly by the muscles. When the cutis is contracted, the epidermis is laid into folds, which disappear again when the skin is stretched: so, as the cutis is stretched in the living skin with its natural attachments, when a piece of skin is cut out, it contracts, and the epidermis is thrown into folds. — (*Virchow's arch.*, xcii. 135.) C. S. M. [1004

Sebaceous glands of the tongue. — Ostmann has counted the sebaceous glands at the root of the tongue in man, and finds that the range in number is about the same in children and in adults, and that they do not increase very much in number with age, and consequently, as the tongue grows, there are fewer and fewer to the square centimetre. In adults the number varied from thirty-four to a hundred and two: the average is sixty-six. In young children the number varied from seventy-four to twenty-eight; average, fifty. — (*Virchow's arch.*, xcii. 119.) C. S. M. [1005

Weight of infants. — Biedert has studied somewhat the weight of sucking children, and gives a few tables of the weight of four children. He especially insists upon the importance, in weighing babies, of selecting a particular time of the day, and recommends two hours after the first feeding in the morning. By weighing twice after a meal, at different intervals, there is shown to be a loss. From a limited number of observations he obtained the following average losses during periods of ten minutes for different ages: first half of the first month, 3.3 grms.; second month, 5.9; third month, 7.7; fourth month, 8.3; fifth month (one child only), 8.1. These are the rates of loss from excretion of all kinds. The other principal point of Biedert's article is, that, with care in weighing, the accidental variations may be nearly all eliminated, leaving only those due to illnesses. In part second the growth of children with minimal nourishment is discussed from a medical stand-point. — (*Jahrb. kinderheilkunde*, xix. 275.) C. S. M. [1006

ANTHROPOLOGY.

Ruins and graves in Greenland. — H. Rink, reviewing the later Danish explorations in Greenland, says that in the southern district of Julianshaab there are about one hundred localities showing old Scandinavian ruins, the largest and most conspicuous containing as many as thirty ruined buildings, consisting of stone walls of houses, shelter-walls, etc.

A number of Eskimo graves have been examined; and it was found, that, where stones were convenient to the dwellings, low mounds were erected. When these were absent, low hillocks, or elevated localities at greater distance, were selected for the burial of the dead. Near Narkerdluk, graves were found on a hill 440 feet high, and these could only be reached by climbing a very steep trail. They are usually single, though frequently two bodies are found in one. The graves are formed by placing stones in the form of a rectangle; and bodies are often found 'doubled up.' In a tomb measuring four feet long, two feet broad, and two feet in height, were found the skulls of thirteen adults and two children. One grave contained two bodies, across and on top of which lay a third. The most remarkable discovery, however, is the existence of apparent cenotaph tombs carefully constructed and covered, and in which the usual number and variety of trinkets were found lying upon the floor or in burial-vessels, but no indications of a body. The author inquires if these tombs can have been erected to the memory of persons who had disappeared mysteriously. — (*Peterm. mitth.*, xxix. iv.) J. W. P. [1007

Researches in Yucatan. — At a meeting of the Société de géographie, M. Désiré Charnay read an account of his recent voyage to Yucatan and the country of the Lacandons. His mission was to study the documents, vases, temples, palaces, and inscriptions, in order to throw light on the age and origin of American civilization. The paper is, to a large extent, historical and geographical, but contains valuable accounts of the ruins of Aké and Chichen-Itza. Interesting descriptions are given of the large and ornate edifices devoted to the national ball-play, which edifices are believed to have been consecrated to the great civilizer, Cuculcan, the same as the Mexican Quetzalcoatl. The chief discovery mentioned is of the ruins of a city on the left bank of the river Usumasinta, in an unclassified region between Guatemala and the two Mexican states of Chiapas and Tabasco. These ruins greatly resemble those of Palenque, and were named Lorillard City in gratitude to Mr. Lorillard of New York, who had generously contributed to the expenses of the expedition. — (*Compte rendu soc. géog.*, no. 21.) J. W. P. [1008

Cossacks. — F. v. Stein furnishes a valuable paper on the history, culture, and distribution of the Cossacks, with a chart showing areas occupied by the several ethnic divisions. — (*Peterm. mittheil.*, no. 71.) J. W. P. [1009

The Solomon-islanders. — Mr. H. B. Guppy has recently visited St. Cristoval in H. M. S. Lark, and gives the results of his studies of the natives. "The average height of a man is about five feet three inches; span of extended arms, four to five inches more than the height of body; both sexes robust and well proportioned, with some exceptions; skin varies from very dark brown to dark copper, the elderly adults being darker skinned than the youth, from causes partly climatic, partly physiological. Some individuals are of a pale, sickly hue, owing to their being covered from head to foot with an inveterate form of body-ringworm, — a scaly skin-eruption which affects in a greater or less degree quite two-fifths of the natives of this part of the group. In its most aggravated condition, this parasitical disease implicates the skin to such a degree that the rapid desiccation and desquamation of the epidermal cells lead to a partial decoloration of the deeper parts of the cuticle. The hair is black, frizzled, and bushy among the younger adults, with a tendency to arrange itself into corkscrew-like spirals among the middle-aged men. Straight-haired natives are sometimes found. Hairiness varies much with individuals, but the surfaces of the body and limbs are generally free from hair. Skull, mesocephalic; index from .73 to .83, mean between .74 to .77; facial angle 85° to 90°; nose straight, coarse, short, with wide nostrils and depressed bridge." — (*Nature*, April 26.) J. W. P. [1010

American bibliography. — Dr. Daniel G. Brinton thus calls attention to a work by Don Diego Barros Arana, published last summer in Santiago de Chile, entitled "Bibliography of anonymous and pseudonymous works on the history, geography, and literature of America." "The compiler is an expert bibliographer, and, in this quarto volume of 171 pages, traces to their authors 507 books on America, published anonymously or under false names. Their dates of issue vary all the way from 1493 to the Centennial exhibition in 1876. Señor Arana adds very instructive and often copious notes on the writers of these productions, and on their value or lack of value." Mr. Brinton adds further notes on the catalogues of Messrs. Robert Clarke, Henry Harrisse, Felix C. Y. Lobron, Joseph Labin, James C. Pilling, Julius Platzmann, and C. H. Berendt. — (*Proc. numism. antiq. soc. Philad.*, April 5.) O. T. M. [1011

EGYPTOLOGY.

Pithom. — In letters under dates March 12, 18, and 26, M. Naville tells of further discoveries at Pithom. The name of the nome in which Pithom is situated is found to be An; this was placed too far south by Brugsch. The following are part of the treasures from Pithom: a seated statue, in black granite, of the high priest of Succoth; a fragment bearing the two cartouches of Ramses II., and the name Succoth; a tablet of black stone with the inscription recording "the foundation of the city of Arsinoë, at some distance from Pithom, by King Ptolemy Philadelphus. The day before, the workmen had found the base of a standing statue with two cartouches, one giving

the name of Arsinoë, but the other quite unknown. I could not make out to whom it referred, but the next day I saw quite clearly. The top of the tablet is occupied by two series of offerings made to the gods of the Heroöpolite nome by the King Ptolemy Philadelphus. Among the gods is his sister, and wife Arsinoë, with the two cartouches, num ab en shu, mer neteru; Arsina. Below are twenty-eight lines of text, written clearly at the beginning and end of the stele, but, unfortunately, very carelessly in the middle. However, the monument is perfect: there is not one sign wanting. It is one metre and a quarter high, and about one metre wide. . . . One thing interested me particularly in the inscription: it is the name of a locality of which Osiris is the god, and which is called Pi-Keheret. Now, I cannot help thinking that we have at last got the Egyptian name for Pi-hahiroth, and (this conjecture, perhaps, is a little presumptuous) that it was called by the Greeks φαγρωριόπολις. This name of Pi-Keheret occurs twice in the text, perhaps oftener, — once in the offering scenes, and another time in the course of the narration. You will understand how important it would be to gain the site of this spot; and that the mere fact of its being in the Heroöpolite nome, in the neighborhood of Succoth and Arsinoë, would definitely put aside Schleiden's and Brugsch's theory of the exodus through Lake Serbonis."

M. Naville is about to publish a narration of the whole work at Pithom, in which he will fully discuss the many interesting questions which have sprung from that work. — (*Academy*, April 7.) H. O. [1012

PHYSIOLOGICAL PSYCHOLOGY.

Children's minds. — In October, 1869, the pedagogical society of Berlin inquired by circular how many of the children who entered the primary classes had seen certain common animals, insects and plants, public buildings, museums, parks, suburban pleasure-resorts, etc. Other questions related to the home, farm, natural history, God, Christ, prayer, and many such subjects.

Profiting by this experiment, Mr. G. Stanley Hall, last September, undertook to ascertain the contents of children's minds on entering the Boston primary schools. Much pains was taken to collate such questions as would yield the best results, and to utilize the most skilful kindergarten teachers in putting the questions. Even with all these aids and cautions, the results were often very amusing. Two tables are given by Mr. Hall, setting forth the words, and the per cent of children ignorant of them. The high rate of ignorance is absolutely astonishing. About ninety per cent did not know where their ribs were situated, and seventy-five per cent could not describe an island. Furthermore, those who knew certain facts — for instance, that cheese comes from the cow — apprehended them in the loosest manner, thinking, perhaps, that the cheese is squeezed from the cow as the juice from a lemon. The same ignorance or indefiniteness of knowledge marked the opinions of the majority of the children concerning natural phenomena, natural history, and physical experiments of the simplest kind. The author comes to the following conclusions: 1. Children know next to nothing valuable at the outset of their school life; 2. Children can best be prepared for school by familiarizing them with objects; 3. Teachers should carefully explore children's minds; 4. The concepts that are most common in the children of a given locality are the earliest to be acquired, while the rarer ones are later. — (*Princeton review*, 1883, 259.) J. W. P. [1013

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

National museum.

Re-arrangement. — The collection illustrative of mammalian osteology, which is in many respects one of the finest in America, is at present undergoing a thorough examination, and will be re-installed for the purposes of exhibition and study. The collection is especially rich in carnivores and cetaceans.

Recent additions. — The French government has presented a complete series of Sèvres porcelains showing the stages of manufacture and the varieties of wares produced. —— The government collections of Washington relics, including the Lewis collection, have been transferred from the Patent office to the museum. —— Messrs. Prang and company of Boston have presented a beautiful collection illustrative of the art of lithography. —— The museum has received from the British museum one of its two stuffed specimens of the Senegal manatee (Trichechus senegalensis), together with a skeleton of the same species. All the recent species of the Sirenians are now represented in the collections.

Notes. — The American pharmaceutical association will hold its session in the lecture-hall of the museum in September. —— The preparators of the museum were severally awarded prizes for specimens of their art displayed at the taxidermists' exhibition held in New York in May.

STATE INSTITUTIONS.

State laboratory of natural history, Normal, Ill.

The fauna of Lake Michigan and the smaller lakes of the north-eastern part of Illinois. — Two weeks were spent by Mr. Forbes and assistants in continued dredging off Chicago for a distance of fourteen miles alongshore, from the harbor to about ten miles out. Animal life here was scanty, except within half a mile of shore. The commonest invertebrate forms were Amnicola limosa, Somatogyrus isogonus, Pleurocera elevatum, Goniobasis livescens, and Sphaerium solidulum, among Mollusca; and Daphnia hyalina, Cyclops Thomasi n. s., Diaptomus sicilis n. s., and Limnocalanus macrurus, among Crustacea. Pontoporeia also occurred occasionally. The most abundant macroscopic plant was Nostoc pruniforme, forming small gelatinous nodules on stones. Vaucheria tuberosa was also not rare.

In order to obtain material for a study of the bottom fauna of the deeper regions of the lake, a trip was made to Grand Traverse Bay in Michigan, a long narrow arm of the lake of extraordinary depth near shore. Here, with the assistance of a steam-tug and a crew of four men, the dredge and trawl were hauled repeatedly in water varying from a depth of thirty to one hundred and two fathoms, and the margins of the bay were searched thoroughly and carefully from a yawl. Numerous specimens of Cottidae were ob-

tained, among them Tauridea spilota, Uranidea gracilis, and several examples of Triglopsis Thompsoni (heretofore found only in the stomachs of fishes). An undescribed variety of Mysis relicta was also very abundant. The commonest copepod was Epischura lacustris, a very peculiar new genus and species. A Nitella was dredged here at a depth of thirty fathoms.

In addition to these operations upon Lake Michigan, ten of the lakes of Lake and McHenry counties were sounded and thoroughly dredged, and full collections made of the plant and animal life of each, from the shore to the deepest water. These lakes were shallow, rarely exceeding a depth of fifty feet; and for purposes of comparison with deeper waters of the same series, Geneva Lake in Wisconsin, having a depth of twenty-three fathoms, was thoroughly searched with dredge and trawl. Later an especially minute and exhaustive study of both the plant and animal life of Cedar Lake was made, not only for the purpose of determining the contents of its waters, but also to afford material for a careful study of the entire system of interactions obtaining among them.

The determination of these collections has but just been commenced, but some general results have already been reached. It was found, that, with the exception of Lake Michigan, the deeper interior portions of these lakes were largely barren of either plant or animal life, probably ninety per cent of their inhabitants being collected within a few rods of the shore. This was apparently due chiefly to the peculiar character of the bottom, which was here a very deep, soft, almost impalpable ooze, consisting of the finest particles of the surface-soil washed in from the adjacent country. No forms peculiar to the deeper water were found in any lake except Michigan. A species of Lumbriculus and larvae of Chironomus were the only bottom animals common in the interior of the smaller lakes (and these occurred equally at all depths), except such as ranged from the surface downward. Larvae of Corethra and many Entomostraca were found in countless numbers at or near the bottom by day, but rose to the surface at night.

PUBLIC AND PRIVATE INSTITUTIONS.

Davenport academy of natural sciences.

Relics from southern mounds. — Observing in SCIENCE, p. 349, a notice of a quantity of astragali of deer, etc., collected from mounds in Ohio, I would call attention to the occurrence of similar objects in southern mounds, with, however, a very interesting peculiarity not mentioned in connection with the Ohio specimens.

We have in the museum of the academy some thirty of those astragali exhumed by Capt. W. P. Hall from mounds in Arkansas, where he has, in several instances, met with a considerable number arranged in a row near a skeleton.

Twenty-two of those we have are ground down at the two ends, forming two faces approximately parallel to each other, and cutting away enough to reduce the bone, as a whole, to something nearly approaching a cubical form; i.e., reducing the length to about equal the width of the bone. In some cases the sides, which are naturally nearly parallel to each other, are ground off a little also, to make them more perfectly flat. The convex side is not ground at all in any of these specimens, nor is the opposite or concave side.

The specimens in this collection must be, some of them, from larger animals than even the elk, — possibly the buffalo, — as they measure from three-fourths of an inch to one and three-fourths in width; and the largest must have been at least three and one-fourth inches long before being subjected to the process of grinding into the desired form. Were they kept as charms, mementos or trophies of the chase perhaps, instruments for gambling? — who will explain?

W. H. PRATT.

Cranial deformation. — There are now in the museum thirty-three skulls from the mounds of the lower Mississippi valley, — Tennessee and Arkansas, — of which a considerable number, though not the greater portion, present the peculiarity of an occipito-frontal compression, in several instances so great as to cause the transverse considerably to exceed the longitudinal diameter. Four of these crania give the following measurements in inches: —

Longitudinal diameter	5.50	Parietal diameter	6.28
" "	5.35	" "	6.03
" "	5.68	" "	6.25
" "	5.96	" "	6.15

while the *normal* form seems to give a length exceeding the breadth by an average of nearly one inch.

All of those so very much compressed are, judging from the condition of the teeth, the heads of young persons, say, from fifteen to twenty-five years. Several of those of older individuals exhibit the same flattening in a less degree, as if partially outgrown after the compression had been discontinued.

In those most flattened, the front especially appears to have been confined by a rigid flat body, as the forehead presents a large surface, which is almost a perfect plane; while the back, where the compressor has been applied, is in some instances slightly concave where the sutures unite.

These skulls are rather thin, and quite well preserved. They are found with the prehistoric pottery; and not unfrequently the very large vessels — fifteen inches or more in diameter — contain one or even two crania, and the other bones of the skeleton.

W. H. PRATT.

Peabody museum of American archaeology, Cambridge, Mass.

Mound explorations in the Little Miami valley, Ohio. — A group of mounds on the estate of Mr. Turner, in Anderson township, was systematically explored last season by Messrs. Putnam and Metz, and a careful survey made by a civil engineer, Mr. Hasbrook. The group embraces 13 mounds and 2 earth-circles, all enclosed by 2 circular embankments, one of them on a hill, and connected with the other by a graded way. The altar-mounds mentioned in SCIENCE, No. 12, were found here. The larger of two mounds within the earthwork on the hill, a plan of which was published by Col. Whittlesey in 1850, proved a most interesting structure, unlike any thing heretofore discovered. It contained a small central tumulus, surrounded by a carefully built stone wall, and covered in by a platform of stones, over which was a mass of clay. On this wall were two depressions, in each of which a body had been laid; and outside the wall, in the surrounding clay, were found several skeletons, one of them lying upon a platform of stones. With these skeletons were found a copper celt, ornaments made of copper and shell, and two large sea-shells. With each of three of the skeletons were a pair of spool-shaped ear-ornaments. The thirteen mounds within the large enclosure differ so much from each other in their structure, that detailed descriptions of each would have to be given, in order to convey a correct idea of this singular and interesting group. Under one of the altar-mounds a large ash-pit, six feet deep, and similar to those in the ancient cemetery at Madisonville, was discovered;

and under another altar-mound were eighteen pits of smaller size, but of similar character. Beneath a small mound containing skeletons was an excavation, six feet wide and twenty-seven inches deep, filled with ashes mixed with animal bones, potsherds, and other objects. This is the first time that pits of this character have been discovered in connection with the mounds; and their presence gives an additional interest to this group. In another mound, containing a human skeleton, a small copper celt was found on the bones of a hand, which is of special interest, as it has a cast of the papillae of the fingers distinctly preserved in the carbonate of copper. Under the centre of one mound was a bed of ashes, in which were three pottery vessels.

Dr. Metz also examined a conical mound on the farm of Mr. Gould, about two miles from Reading, on an elevated and commanding site. The mound was six feet high, and sixty feet in diameter at the base. An earth embankment, three feet high and twenty-two feet wide at its base, encloses the mound, forming a circle about it one hundred and fifty feet in diameter, with an opening thirty-seven feet wide looking to the south-east. The mound was found to be stratified; the outer layer was composed of fifteen inches of very hard yellow clay; under this was a layer, ten inches in thickness, of hard clay, burnt to a brick-red color, and mixed with ashes and charcoal; below this was a stratum fifteen inches in thickness of compact grayish ashes containing pieces of burnt stone; beneath this again ten inches of burnt clay, in which were a small chipped flint and a fragment of burnt bone, which was the only piece of bone found in the mound; beneath this last stratum, and occupying the central portion of the mound, was a conical heap of hard gray earth in which were small flakes of charcoal. This gray earth was so hard that it could only be removed by the use of the pick: it was eight by ten feet in diameter, and twenty-two inches in thickness in the centre. Under this hard mass, and below the natural surface of the clay, were four circular pockets or excavations about four inches apart, each of which was ten inches deep and fourteen inches wide; three of them were filled with a dark pasty substance, which became hard on drying, and the other contained fragments of stone, burnt clay, and earth. The structure of this mound is unusual; and the purpose for which it was erected over the four small holes is at present unknown, adding one more to the problems relating to the mounds, which we can only hope to solve by thoroughly exploring such as have not yet been disturbed.

NOTES AND NEWS.

Since the first pages of this issue were in form, it has been announced that a party for the relief of the observers under Lieut. Greely at Lady Franklin Bay will leave St. Johns, Newfoundland, on one of the steam sealing-vessels belonging at that port, about June 15, probably accompanied by a naval vessel as tender. It will be commanded by Lieut. E. A. Garlington, U.S.A., and composed of twelve men, of whom ten are stated to be old sailors and accustomed to the use of boats. Twenty dogs, native drivers, and a supply of fur clothing, have been secured at Godhavn, Greenland. The party at Lady Franklin Bay will be reached and withdrawn if the state of the ice permits. If not, the relief-party is to be landed on Littleton Island; and, while part of them are engaged in preparing winter quarters, Lieut. Garlington will endeavor to open communication by sledges with Greely's people. In the failure of the first attempt, another will be made in the spring of 1884. It is to be hoped, if Greely is not reached, that an attempt will be made to leave at Cape Hawkes or Cape Sabine, if not the relief-party as a whole, which would be best, at least a boat by which the open water to be anticipated between those points and Littleton Island next year (1884) may be passed by a retreating party, which might well find their own boat unseaworthy after dragging it over many miles of hummocky ice, if, indeed, they did not find themselves obliged to abandon it.

— The schooner Leo is on the point of sailing for Point Barrow to withdraw the signal-service observing party under Lieut. Ray, in compliance with the act passed by the last Congress. To utilize the opportunity, Mr. Marr of the U. S. coast-survey will accompany the vessel with the design of making absolute magnetic determinations, of fixing the astronomical position of the station, and of making pendulum observations.

— In 1880 the French minister of public instruction appointed a commission to investigate the zoölogy and physical features of the deep sea under the direction of M. Alphonse Milne-Edwards. It carried on its investigations that year principally in the Bay of Biscay; in 1881, in the Mediterranean; and, in 1882, in the Atlantic as far as the Canaries. This year it will push its researches farther in the Atlantic as far as the region opposite the coast of Senegal and in the Sargasso Sea. The present commission is composed of Professor Alphonse Milne-Edwards, president; the Marquis de Folins; Professors Léon Vaillant and Edmond Perrier, of the Paris museum; M. Fischer, aide-naturaliste at the same establishment; and Professors Marion of Marseilles and Filhol of Toulouse; MM. Charles Brongniart and Henry Villaine, of Paris, are also attached to the commission as 'membres adjoints.'

— By the programme for the summer meeting of the American institute of mining engineers, the opening session will be held in Roanoke, Va., on June 4. A visit to Lynchburg will be made on June 5. On arrival at Lynchburg, a train will take the party to the iron-mines on the James River, at Riverville, and, if time allows, also to Stapleton. In the afternoon a session of the institute will be held. Return to Roanoke in the evening. On June 6 there are to be local excursions around Roanoke, visiting the Crozer furnace, Upland and Houston mines, Rorer iron company's mines, and the Roanoke machine-works; evening session. June 7, excursion to Pocahontas (Flat Top coal-fields), and the Southwest Virginia improvement company's coal-mines and coke-ovens. Returning, the Ripplemead mines

and Bertha zinc-works will be visited. The night will be spent at Abingdon or Wytheville. June 8, excursion to the Cranberry magnetic iron-ore mines in East Tennessee, returning to Roanoke in the evening.

On returning home, members can stop at the Natural Bridge and the Caves of Luray. Those wishing to visit the Cripple Creek ore region can do so by remaining after the close of the meeting. The Shenandoah Valley and the Norfolk and Western railroads have generously offered free transportation to members and the ladies of their families over their lines to and from Roanoke, and also for the excursions of the meeting. The local committees of arrangements are, in Roanoke, J. H. Bramwell, chairman; J. H. Sykes, secretary; Dr. F. Sorrell; Frank Maddock; Major Andrew Lewis; J. Allan Watts; in Lynchburg, Capt. C. M. Blackford, chairman; John H. Flood; George M. Jones; P. J. Otey; W. B. Robinson; T. B. Deane; C. W. Button; T. D. Davis; H. Grey Latham; Alex McDonald; L. S. Marye; John Stevenson, jun.

— An enterprising railroad in Ohio, the Cleveland, Akron, and Columbus railway, has made a new departure in its time-tables by adopting a system which has been approved of, but not ventured upon by many railway companies in the country. On its time-cards the hours are numbered from one up to twenty-four, the latter being midnight. The confusion which so often exists between the A.M. and P.M. hours is thus avoided. Thus one train arrives in Cleveland at 19.30, and one departs from Columbus at 17 o'clock. This road also carries upon its morning trains weather-signals, devised and set by the Ohio meteorological bureau, from predictions furnished by the United States weather-service. It is believed to be the first railroad in the country, if not in the world, to adopt either of these schemes.

— In the Missionary herald for November, 1882, Dr. Nichols wrote from Bailunda, West-central Africa, June 26, "There has been a notable comet hanging in the sky near Venus for weeks; but the natives, so far from feeling any superstitious dread, seem utterly indifferent to it." After this was published, Gen. Hazen, of the Signal-service at Washington, wrote to the Missionary house, inquiring about the letter of Dr. Nichols. Gen. Hazen thought the writer must have been mistaken, as this would be, he thought, the earliest announcement of the comet. He suggested that perhaps the zodiacal light had been mistaken for a comet. By the next mail, Dr. Nichols's attention was called to this; and in a letter received April 22, dated Bailunda, Jan. 25, to Dr. Means of the Missionary house, he writes, "Be certain that that comet of ours was a veritable one, and not a zodiacal light. There was a small but well-defined nucleus, and its motions amongst the constellations were watched by all here."

— Interesting investigations have been carried on during the past year by the agricultural experiment-station recently established in connection with the chemical department of Cornell university. The work done includes experiments on fodders, ensilage, and analysis of agricultural products, the results of which have been collected in the annual report now in press. The analyses were made by the chemist of the station, under the direction of Professor Caldwell, who, in conjunction with the professor of agriculture, superintended the experiments on feeding and ensilage.

— S. Philipp has lately published a philosophical work on the ego of organisms, and the origin of life in unorganized matter, which, together with the cognate writings of Montgomery, are briefly noticed in the *Biologisches centralblatt* for April 1. Those sceptical as to the value of such lucubrations will attribute a meaning to the date in this connection.

— Professor Targioni Tozzetti has just published a report on *Ortotteri agrari*, under the direction of the Italian department of agriculture, industry, and commerce. The introduction relates chiefly to the external anatomy of Orthoptera. In the classification of the order, Professor Tozzetti uses the term 'Orthoptera' in its widest sense, and divides the order into the following suborders: 1. Tisanuri; 2. Ortotteri veri; 3. Corrodenti (Psocidae and Termitidae); 4. Ortotteri amfibiotica (the rest of the Pseudoneuroptera). After treating of the migrating locusts (cavalette) of all countries, and the means for their destruction, a third part gives short instructions how to prevent and counteract the ravages of the Italian species of Acrididae. This seems to be intended for separate distribution among farmers, as the illustrations are repeated from the first part of the volume. A collection of the locust laws made in Italy (beginning with the Mandate from the 'consules agriculturae,' dated April 27, 1654), France, and Spain, and the collected citations from ancient authors relative to Orthoptera, appear in appendices.

The report contains much interesting matter, and will, no doubt, prove useful to the Italian agriculturist; but in its economic and natural history parts it is a mere compilation from other sources, and bears evidence, we regret to say, of hasty work, such as we should not expect from its author. We notice many inaccuracies and typographical blunders, and the figures are for the most part at second hand and poorly copied.

— Some vine-cuttings from Madeira, recently received at New York, caused no little consternation on the supposition that they were infested with Phylloxera. Samples were referred for examination to Dr. J. P. Battershall, who, after microscopic examination, was unable to detect the presence of Phylloxera, but concluded that the vines looked suspicious. Samples were finally sent to the department of agriculture, and submitted to Professor Riley, who found no trace of Phylloxera, and who recommended that the cut-

tings be forwarded for the following reasons: 1. The cuttings came from an uninfested district, so far as known; 2. The insect could only be found at this season on such cuttings in the winter-egg, which, even in countries where the Phylloxera abounds, is extremely rare; 3. Did the cuttings come from a country badly infested with Phylloxera, the danger of the introduction of the pest upon them would be very slight, as the natural history of the insect shows; 4. Even were it possible to introduce the insect with the cuttings, no harm could result, so long as they were sent to any part of the United States east of the Rocky Mountains, since the insect is indigenous here. Were the cuttings known to be infested then, and then only, Professor Riley thinks that prudence would dictate that they should not be sent to the Pacific states, or those portions where the Phylloxera does not now exist.

— Those who have resided a short time in the low pine regions of the Atlantic coast, from Virginia to Carolina, are familiar with the word 'tuckahoe.' The term is a very old one, found in Smith's History of Virginia as 'tockawhoughe,' and in other old writers under different spellings. Professor Gore, of the Columbian university, has been investigating the subject, and has brought to light many important facts relative to it, which appear in the Smithsonian report for 1881. The word has been made to apply to almost every tuberous root and subterraneous fungus which the aborigines were supposed to have used as food. The qualities of all these substances have gradually come together, and by tradition have settled upon one that has little or no value as food, — the Pachyma cocos. This interesting fungus has been analyzed by several chemists, Dr. Torrey among the number, and finally by Dr. Parsons of the department of agriculture. The most notable peculiarities are the entire absence of starch, the small amount of extracted solvents, the gelatinous character of the cellulose, and the very small amount of albuminous substance. The fungus resembles a large yam, with a rough, blackish exterior, and a white, cream-colored interior, very soft when first found, and becoming hard and ivory-like when thoroughly dry.

— The International African association was formed in Brussels in 1876, with an executive committee consisting of the King of Belgium, Dr. Nachtigal, De Quatrefages, and Sir Bartle Frere, the latter being replaced on his departure for the Cape of Good Hope by Mr. Sanford. In the first year of its existence, Belgium alone furnished half a million francs, and the remaining branch societies in other countries about a hundred thousand francs, towards the expenses of exploration. In June, 1877, a commission of delegates from all parts of Europe laid out a plan of work, deciding to begin the establishment of stations between Zanzibar and Tanganyika, of which Karema, five hundred miles from the coast, was the first. A small steamer was placed on the lake. Other stations in the same region were later undertaken by different branches of the association. In November, 1878, a '*Comité d'études du Haut-Congo*' was formed, with a capital of one million francs. This was essentially a subdivision or a new form of the old society; and its first work was to send Stanley to the Kongo at the end of 1879, where he spent two years in constructing a road along the unnavigable part of the river. The funds of the committee are exhausted, and contributions are asked for to continue the work thus begun.

— The April number of the *Johns Hopkins university circular* contains abstracts of many of the recent papers published by members of the university. Under the heading of 'correspondence' are several letters to Professor Sylvester. As a foot-note to one of these, Professor Sylvester remarks, that the last few months will be a period forever memorable in the records of mathematical science as one in which came to light the three great discoveries of a proof being possible of the impossibility of the quadrature of the circle, the existence of an assymptotic value to the sum of the logarithms of the inferior primes to a given number, and the falsity of the ordinarily assumed postulate in the theory of invariants.

— Mr. Robert Ridgway is engaged in a field-examination of the avi-fauna of Illinois and Indiana.

— Dr. R. W. Shufeldt, U.S.N., on duty at New Orleans, La., is engaged in the study of the zoölogy and archeology of southern Louisiana. He has already made very extensive collections of the reptiles and birds of that region.

— In view of the proposed meeting of the British association for the advancement of science in Montreal in 1884, a committee, consisting of Messrs. H. Carvill Lewis, Edward D. Cope, Persifor Frazer, Angelo Heilprin, and Henry C. McCook, has been appointed by the Academy of natural sciences of Philadelphia to secure the co-operation of other societies and institutions of the city in extending an invitation to the American association for the advancement of science, to meet in Philadelphia the same year, directly after the Montreal meeting, so as to increase the facilities for communication with the representatives of the British association. Similar action has been taken by the American philosophical society and the Franklin institute; and the University of Pennsylvania has offered the use of its halls for the meetings.

— It is now stated that as many as four hundred members of the British association have signified their wish to attend the meeting in Montreal in 1884. The local committee at Montreal has decided to suggest the week beginning on Aug. 27 as the most suitable for the meeting.

— A circular has been issued by the Forestry division, department of agriculture, calling attention to

the interest now taken in planting trees in school-grounds, and giving information as to where to plant, what should be planted, and when to plant. It is suggested that the formation of arboretums is desirable, and that collections at the schools, of the native woods of the locality, might increase the interest of the scholars.

RECENT BOOKS AND PAMPHLETS.

Absterbeordnung, Ausgeglichene, mortalitätstafel u. tafel der lebenserwartung f. d. gesammtbevölkerung d. Preuss. staates. Berechnet aus d. mittelwerthen d. preuss. sterbetafeln f. d. j. 1867, 1868, 1872, 1875, 1876, u. 1877. Berlin, 1883. f°.

Album schweizerischer rindvieh-rassen. 20 Photographien. Luzern, 1883. f°.

American museum of natural history (Central Park, N.Y.). The fourteenth annual report. N.Y., *Martin pr.*, 1883. 38 p. 8°.

Amerika's nordwestküste. Neueste ergebnisse ethnologischer reisen. Aus den sammlungen der Königl. museen zu Berlin. Hersg. v. d. direction d. ethnolog. abtheilung. Berlin, 1883. Illustr. f°.

Andra, E. Le gélatino bromure d'argent, sa préparation, son emploi, son développement. Paris, *Gauthiers-Villars*, 1883. 77 p. 18°.

Becker, Les arachnides de Belgique. Vol. i. Attidae Lycosidae, Oxyopidae, Sparassidae et Thomisidae. Bruxelles, 1883. 246 p., illustr. f°.

Bedriaga, J. v. Beiträge zur kenntniss d. amphibien u. reptilien d. fauna von Corsika. Berlin, 1883. 150 p., illustr. 8°.

Behrend, G. Die eismaschinen und ihre verwendung zur kühlung von räumen u. flüssigkeiten. Halle, 1883. Illustr. 8°.

Bovey, H. T. Applied Mechanics. 2 parts. (I. Definitions and general principles as to the strength of materials; The strength and stiffness of beams; Resistance to compression and crushing, etc. II. Frames; Roofs; Bridges; Suspension Bridges, etc.) Montreal, 1883. 8°.

Comité, international des poids et mesures. Sixième rapport aux gouvernements signataires de la convention du mètre sur l'exercice de 1882. Paris, 1883. 52 p. 4°.

Cotteau, E. De Paris au Japon à travers la Sibérie, voyage exécuté du 6 mai au 7 août 1881. Par Edmond Cotteau, chargé d'une mission scientifique. Paris, *Hachette*, 1883. 456 p., illustré. 18°.

Eder, Josef Maria. Ausführliches handbuch der photographie. Mit 600 holzschnitten und 6 tafeln. Heft 1–5. Halle a. S., *Knapp*, 1882–83. 542 p. 8°.

Freyer. Studien zur metaphysik der differentialrechnung. Berlin, *Weber*, 1883. 39 p., 1 pl. 4°.

Ganguillet u. **Kutter.** Versuch zur aufstellung einer neuen allgemeinen formel für die gleichmässige bewegung des wassers in kanälen u. flüssen, gestützt auf die resultate der in Frankreich vorgenommenen umfangreichen u. sorgfältigen untersuchungen u. der in Nordamerika ausgeführten grossartigen strommessungen. Bern, 1883. 123 p. 8°.

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Gerosa, O. Della propagazione nel regno animale. Parte I. Capodistria, 1883. 50 p. 8°.

Glaser-DeCew, Gustav. Die magnetelektrischen und dynamoelektrischen maschinen und die sogenannten secundärbatterien; mit besonderer rücksicht auf ihre construction. Mit 54 abbildungen. Wien, etc., *Hartleben*, 1883. (Elektro-techn. bibl., i.) 16+263 p. 16°.

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Hartig, J. Lehrbuch der baumkrankheiten. Berlin, 1882. 11 pl. 8°.

Hauck, W. Ph. Die galvanischen batterien accumulatoren und thermosäulen; eine beschreibung der hydro- und thermoelektrischen stromquellen mit besonderer rücksicht auf die bedürfniss der praxis. Mit 85 abbildungen. Wien, etc., *Hartleben*, 1883. (Elektro-techn. bibl., iv.) 16+320 p. 16°.

Japing, Edward. Die elektrische kraftübertragung und ihre anwendung in der praxis; mit besonderer rücksicht auf die fortleitung und vertheilung des elektrischen stromes. Mit 45 abbildungen. Wien, etc., *Hartleben*, 1883. (Elektro-techn. bibl., ii.) 16+239 p. 16°.

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